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THE
HANDMAID
John TO THE Evrard
ARTS,

VOL. THE FIRST.

TEACHING,

I. A perfect knowledge of the MATERIA PICTORIA, or, the nature, uſe, preparation, and compoſition of all the various ſubſtances employed in PAINTING, as well *vehicles*, *dryers*, &c. as *colours*; including thoſe peculiar to enamel and painting on glaſs.

II. The means of delineation, or the ſeveral DEVICES employed for the more eaſily and accurately making DESIGNS FROM NATURE, or DEPICTED REPRESENTATIONS; either by *off-tracing*, *calking*, *reduction*, or other means; with the methods of taking *caſts*, or *impreſſions*, from *figures*, *buſts*, *medals*, *leaves*, &c.

III. The various manners of GILDING, SILVERING, BRONZING, with the preparation of the genuine GOLD and SILVER *powders*, and imitations of them, as alſo of the *fat oil*, *gold ſizes*, and other neceſſary compoſitions;—the art of JAPANNING, as applicable not only to the former purpoſes, but to coaches, ſnuff-boxes, &c. in the manner lately introduced;—and the method of STAINING DIFFERENT KINDS OF SUBSTANCES, *with all the ſeveral colours*.

The whole being calculated, as well for conveying a more accurate and extenſive knowledge of the matters treated of to profeſſed artiſts, as to initiate thoſe who are deſirous to attempt theſe arts, into the method of preparing and uſing all the colours, and other ſubſtances employed in *painting* in *oil*, *miniature*, *crayons*, *encauſtic*, *enamel*, *varniſh*, *diſtemper*, and *freſco*, as alſo in *gilding*, &c.

The SECOND EDITION, with conſiderable Additions and Improvements.

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TO THE

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FOR THE

Encouragement of Arts, Manufactures, and Commerce.

GENTLEMEN,

THE correſpondence betwixt the deſign of this work, and the views of your inſtitution, naturally points out to me, to whom it may be addreſſed with the greateſt propriety.

The furniſhing means of eſtabliſhing and improving uſeful arts, eſpecially thoſe which relate to conſiderable manufactures, and the creating incitements and motives to the exerciſe of thoſe means, are to a country that owes its riches, power, and even domeſtic ſecurity to commerce, of the greateſt concern and moment; and it is more peculiarly meritorious in thoſe, who, in a private capacity, exert their utmoſt endeavours on theſe accounts, as ſuch purſuits ſeem to take up a very little ſhare of the regard of the public here, at a time, when all the neighbouring governments (eſpecially that of our rival France) make them a principal object of their attention and care. To you, therefore, I dedicate this book, as it is not only in your power, but intirely within the ſphere of your profeſſed intentions, to enforce, in a more extenſive and publicly beneficial way, the practice of many particulars taught in it.

I am, GENTLEMEN,

Your moſt obedient,

and humble Servant,

The AUTHOR.

THE

PREFACE.

THAT the national improvement of ſkill and taſte, in the execution of works of *deſign*, is a matter of great importance to any country, not only on account of the honour which is derived to civilized nations by excelling in the polite arts, but likewiſe of the commercial advantages reſulting from it, will be allowed by all who have not very ſingular notions with reſpect to theſe matters; though, in what degree ſuch improvements are eſſentially intereſting to us at preſent, is ſcarcely conceived by any, but thoſe who particularly concern themſelves in ſpeculations of this nature. The ſtrong diſpoſition that prevails not only in the European countries, but in the reſpective ſettlements of their people in Aſia and America, for uſing thoſe decorations and ornaments in dreſs, as well as buildings, equipages, and furniture, that employ the arts of deſign, gives at preſent the foundation of ſeveral of the moſt conſiderable branches of trade; and this is daily increaſing, with the luxury that ſeems removing from the Eaſt, and ſpreading itſelf over theſe Weſtern countries and their colonies, in ſuch manner, as will probably ſoon render ſome articles of this kind equal in return to the moſt ſtaple and extenſive of thoſe of the former commerce. As, moreover, ſeveral circumſtances both of our œconomical and political condition, by enhancing to a very high degree the price of common neceſſaries, and introducing more expenſive modes of life, are depriving us of the ſhare we had of the groſſer manufactures that depend on labour, it peculiarly behoves us at preſent to exert ourſelves in cultivating thoſe of a more refined nature, where ſkill and taſte (in which we by no means ſeem naturally wanting) are required to give a higher value to the work, and to ſtand in the place of a higher proportion of manual operation.

It muſt be with regret, therefore, we ſee the French have long got the ſtart of us in this very material purſuit; and that the encouragement given by their government, together with the opportunities afforded by a well-inſtituted academy, has diffuſed ſuch a judgment and taſte in *deſign*, among all claſſes of artizans, as render France at this time the ſource of nearly all invention of faſhions, and neceſſarily occaſion an extreme great demand from her for all thoſe articles, in the production of which ſuch talents are exerciſed.

The advantages which France has now over us in theſe concerns, are not however ſo well ſecured, that we ſhould deſpair of being able, in time, to wreſt them out of her hands. For where the mechanical part, either as it depends on machines or manual dexterity, is in queſtion, we have given on all occaſions the proofs of ſuperior abilities; and whenever, therefore, the improvement of fancy and propriety in the deſigning of models and patterns ſhall be ſo far advanced here, as to put us on a level with her in thoſe points, we ſhall ſoon become as formidable a rival to her, in what ſhe now conſiders her *peculium*, as ſhe has in a parallel manner been before to us, in the woollen trade, from our advanced price of labour.

The meaſures by which this very deſirable end may be attained, conſiſt of three particulars; the founding a well-regulated academy, where not only youth and novices may have an opportunity of being will initiated in the principles of *deſign*; but where even artiſts themſelves may have the means of inducement to further ſtudy, in order to the ſtrongeſt exertion of their genius;—the creating ſuch incitements, by pecuniary rewards or honorary diſtinctions, to excel in theſe arts, and more eſpecially in the application of them to the perfecting thoſe manufactures, to which they have any relation, as may ſtimulate the more indolent, and raiſe greater emulation among the forward, to apply their utmoſt powers to excel;—and the diffuſing a more general and accurate knowledge of thoſe ſecondary or auxiliary arts that are requiſite to the practiſing *deſign*, or to the execution of works dependent on it. The firſt of theſe means, viz. the erecting an academy of arts, we muſt hope, will be ſometime thought an object worthy the notice and care of the government; ſince it is too apparent, from the failure of the attempts already made, that nothing effectual with regard to it can reſult from the efforts of private perſons. The ſecond might be procured by a right diſpenſation of the premiums of the ſociety inſtituted for that purpoſe. The laſt are intended to be ſupplied by this work, but with what title to ſucceſs, I muſt leave it to the judgment of the public to determine; only I will take the liberty of ſhewing ſomewhat more explicitly here, in what particular manner it is propoſed to effect this end.

A diſquiſition on the MATERIA PICTORIA makes the firſt part; where the natural hiſtory, preparation, and uſe, of not only the ſubſtances of which colours are formed, but of all others rendered ſubſervient in any way to the purpoſes of painting, are diſtinctly taught, with the manner of compoſition, and application of them, as they depend either on mechanical or chymical operations. The principal view in this diſquiſition is to enable thoſe, who have already learned to draw, to make themſelves eaſily maſters of painting in any manner they may chooſe; by which aſſiſtance many perſons of genius, who, from ignorance of the nature and uſe of colours, might be deterred from it, may be both induced and enabled to attempt painting ſucceſsfully, and bring thoſe talents into practice, which would be otherwiſe loſt to the public and themſelves. But is not to thoſe alone the view of benefit is confined. The preſent adulterate and imperfect preparation of the colours, from the ſordidneſs and ignorance of the Jews, and other low people concerned in the preparation of them, is a diſadvantage of the higheſt moment to ſuch as paint, even with the greateſt ſkill, either in oil or water; and for which they can find no appoſite remedy without ſome aid of this kind; for, as the preparation of colours is kept a ſecret in the hands of thoſe few who manufacture them, either here or abroad, and conſequently is very little known to modern painters; and as a much greater ſhare of knowledge in natural hiſtory, experimental philoſophy, and chymiſtry, is required to the underſtanding the nature of the ſimples, and principles of the compoſition, in a ſpeculative light, than is conſiſtent with the ſtudy of other ſubjects more immediately neceſſary to an artiſt; there remains no means of ſurmounting this difficulty, but the being ſupplied, by ſome perſon, whoſe application could be more properly directed to the attainment of this ſcience, with ſuch a ſyſtem of the theory and practice of every thing relating to the *Materia Pictoria*, as may enable them either to prepare the colours themſelves, where not to be otherwiſe obtained perfect, or to judge critically with ſome certainty of the goodneſs of ſuch as they procure from others. This I have therefore attempted on their behalf, and I hope not in vain, as not only a general acquaintance with the practice of the ſeveral branches of the chymical art, but a very large experimental enquiry into the nature of theſe ſubjects in particular, form my pretenſions to ſome knowledge of them.

As the depravity of the manner of preparation has alſo extended itſelf to the very priming of cloths for grounds of painting, (a work truſted too neglectfully at preſent to the care of colourmen) from whence great inconvenience to the painter, and detriment to the pictures, are produced, I have ſubjoined a method, by which thoſe, who are really in earneſt about the merit of their performances, may procure cloths to be made without either ſtiffening, cracking, or cauſing (as it is called) *the colours to ſink in.* And, as this has an apparent utility with reſpect to painters in the caſe of new pictures, ſo the improvements offered in the methods of cleaning, preſerving, and mending the old, are not leſs obviouſly beneficial to others poſſeſſed of the works of former maſters. The art of cleaning pictures being indeed of the utmoſt conſequence to the intereſt of *taſte*, as no lover of the polite arts can reflect, without the utmoſt regret, on the vaſt havock made in the works of all the great painters by erroneous and faulty management in this point.

The explanation of the nature, and manner of application of the colours, grounds, &c. uſed in that method, called *painting in encauſtic*, is here firſt introduced into the work, in this ſecond edition of it. Whatever has been hitherto brought before the public under this name, muſt be conſidered rather as an eſſay towards a new manner of painting, than the completion of an art. When this work was firſt printed, Count Caylas was the ſole perſon who had offered any thing of ſuch a kind to the world; and what he publiſhed of his trials, only ſeemed to prove the difficulty of bringing this method to any uſeful degree of perfection. Since that time, many other perſons have made attempts in the ſame way; and Mr. Muntz has publiſhed a treatiſe on the ſubject, in which, he pretends, to have made ſuch improvements on Count Caylas's method, as to have rendered this manner of painting of practical importance. The concurrence of others with him in this opinion, and the attention which the public have given to this matter, have rendered ſome notice of it, at preſent, proper in this work. I have therefore preſented a full, tho' conciſe account of whatever material has been advanced on this head, with ſuch obſervations, as well on the whole, as ſeveral particulars, as occurred to my own judgment.

A complete ſyſtem of the theory and practice of enamel painting, forms the next article, the value of which will be beſt underſtood by thoſe for whoſe uſe it is intended. For as this art is of late introduction among us, and the manner of conducting it, with reſpect to the preparation and compoſition of the colours, fluxes, and grounds, has been carefully concealed in the places abroad where it has been longer eſtabliſhed, a very ſmall ſhare of knowledge in the preparation of the colours, and yet leſs of that of the grounds and fluxes, is the whole hitherto gained by the artiſts of this country. They are for the moſt part obliged to employ a white enamel prepared at Venice for their ground, to pick up the remains of a kind of glaſs formerly made there for a flux, and to procure the colours, either in a more perfect or faulty ſtate as they can meet with them, except in the caſe of thoſe who have recipes for ſome kinds which they prepare; but with that precariouſneſs of the qualities, that attends the blindly following recipes, without any comprehenſion either of the general properties of the ingredients, or principles of the operations. From which circumſtances, uncertainties in the ſucceſs, and embarraſſments in the work, are the frequent reſult, as well as from a want of underſtanding the nature of the ſubſtances they uſe, as the not being able to procure what is good of each kind, or fit for their particular purpoſe.

The aſſiſting in the cultivation of the art of enamelling here was indeed one principal object of the deſign of this book, as ſuch art is very materially intereſting to us at preſent; for it is become the baſis of a manufacture, from which we may expect great advantages; ſince we already ſee it carried ſuddenly to ſuch a degree of perfection, with reſpect to the facility of working, as to raiſe a demand for the produce in foreign markets; notwithſtanding the long practice and cheap living of the people of Geneva, who had been in poſſeſſion of this branch of commerce for a conſiderable time, gave them originally the greateſt advantages in it over us.

This part of the work has been cenſured by ſome, who have conſulted the former edition, as giving erroneous or inſufficient inſtructions with reſpect to the preparation of ſeveral of the colours. But I am ſatisfied, that as to moſt of thoſe objections, the error, or defect, lay rather in the manner of trial to put them in practice, of thoſe who condemned them, than in the inſtructions themſelves. It is not indeed to be wondered at, that perſons who are wholly unaccuſtomed to chymical proceſſes, ſhould miſcarry in the attempting ſome of theſe, which are of the niceſt kind, and where the intention may be fruſtrated by ſo many minute accidents; and therefore not a juſt concluſion, to infer from experiments ſo made, that the end propoſed may not be effected by the ſame means more accurately applied. The proceſs for obtaining a crimſon colour from gold, is an inſtance, which verifies this in the ſtrongeſt degree. For though many have attempted this matter without the deſired ſucceſs, yet I have unqueſtionable evidence, that others have obtained the end, even beyond their moſt ſanguine expectations, without the leaſt aid, but what they have received from this work. The ſame holds good of moſt of the other articles of importance, reſpecting the art of enamelling, and I have therefore made very little change in this edition, except the adding ſome new articles, as to this part of the work.

The painting on glaſs with vitreous colours, is not a matter of equal importance with enamelling; but, as it is conſidered as one of the arts of which the myſtery is at preſent loſt to us, (though, on the contrary, being in fact nothing more than painting with tranſparent enamel colours on glaſs grounds by much the ſame methods, the modern improvements made in the art of enamelling have given us an equal ſuperiority in this) I thought it a neceſſary part of the work; and have accordingly entered on an explanation of the whole of it; availing myſelf, nevertheleſs, of its affinity with enamel painting, ſo as to refer for moſt particulars to what was before laid down on that ſcore, and enlarge only on ſome points in which a difference is found betwixt them. But I flatter myſelf, that, notwithſtanding the brevity of the manner, any perſon may, by a proper attention to what is delivered on this head, eaſily make himſelf maſter of every thing peculiar to painting on glaſs.

The gilding enamel and glaſs by vitreous colours, and annealing, was a neceſſary appendage to the art of painting in enamel; but there is yet another circumſtance which made the communication of the beſt methods of doing this of ſome conſequence to the public. It is the great demand now ſubſiſting for drinking glaſſes with gilt edges, which are moſtly, at preſent, either imported from Germany, or fraudulently imitated here by gilding with gum water or ſizes that will not bear moiſture; though, were the means well underſtood, they might in large parcels, with very little more expence or trouble, be done in the genuine manner.

The method of taking off mezzotinto prints on glaſs, which makes the next article, is not a matter of any great moment; but, as the practiſing it is very alluring, by the production of pictures even without being able to draw, it may be an inducement to ſome to apply themſelves to painting and the ſtudy of *deſign*; ſince thoſe will not long reſt ſatisfied with this manner of exerciſing their fancy, who have a genius for greater things.

The art of waſhing maps and other prints is however of more general uſe, and requires no apology for holding a place in the work.

The devices and mechanical means employed for the more eaſily and accurately obtaining out-line ſketches of deſigns after nature or works of art, which begin the ſecond part, are of the greateſt aſſiſtance and ſervice to all who paint or draw; and though moſt of them are known to artiſts of larger experience, yet beginners are to learn them, and moſt frequently want an adequate opportunity. On their account, therefore, they were neceſſary for the anſwering the full intention of this book; and perhaps even ſuch as are more verſed in theſe matters, may meet with ſomething not unacceptable to them in a collection of inventions of this nature, ſo copious as that given.

The methods of caſting in large, which follow in this part, will be much leſs extenſively uſeful, as it is practiſed only by few; and the managing it in more difficult caſes not eaſily reducible to rule. But ſome notice of them were wanting to render the ſyſtem complete; eſpecially as they are connected ſo as not to bear well a ſeparation from them with thoſe of caſting medals and other ſmaller pieces, and the manner of taking off impreſſions from various ſubjects; both which are articles of very general utility.

The diſplaying the ſeveral methods of gilding, which is done in the third part, will be found a convenience to numbers, who would occaſionally practiſe them, if they had the means in their power; and the application of the art of japanning to ſo many purpoſes, where a mixture of gilding is required, as the introduction of *papier mache* has occaſioned lately, makes this communication particularly ſeaſonable at preſent.

The article of gilding leather, as practiſed for the manufacture of hangings, ſkreens, &c. is of very great importance. It is indeed only practiſed by ſome few, who carry on great concerns in it; but I thought an explanation of the art merited a place here, as it may furniſh the means of ſuch trials to others, as may lead to improvements. There is more reaſon to hope this, as the method here deſcribed is that practiſed in France at preſent, and differs in ſome particulars from the Engliſh. The principal object is the compoſition of the lacquer or varniſh, which is every where concealed as a ſecret by the manufacturers. But the recipe here imparted will produce ſuch, as is at leaſt equal to the beſt hitherto in uſe.

Silvering and bronzing have alſo their utility; though in a leſs degree than gilding; and therefore properly claim to follow it, as they are in fact only different applications of the ſame means.

The knowledge of the methods of japanning is at preſent more wanted than that of any other of the myſterious arts whatever, as it is now demanded to be practiſed on coaches and other vehicles in a very large and expenſive way, by thoſe who till lately were utter ſtrangers to it. Information of this kind, ſuch as is intended to be conveyed in the fourth chapter of this part, is in a peculiar manner requiſite to them, that they may the more eaſily and readily execute thoſe deſigns they have ſhewn themſelves capable of making, (when ſufficiently paid to afford the due application) with a taſte and judgment, that proves them to be not greatly inferior to the French in this ſpecies of performance, though ſo lately undertaken by them.

Lacquering had too great an affinity with japanning not to be joined with it in this work, though it is of leſs conſequence. Having, however, been carried by ſome to much greater perfection here than in any other country, even to the rivalling gilding in its effect, the communicating the beſt compoſition of lacquer to numbers, who are either compelled to purchaſe what they uſe of particular perſons that have the ſecret of preparing it, or to employ a very inferior kind of their own production, is not without ſuch advantages as may make it to be properly conſidered as one means of improvement in the more elegant manufactures.

The means of ſtaining paper, parchment, wood, ivory, bone, horn, and ſtones of any kind, with all the variety of colours, make the laſt contents of this work, and will, I hope, for purpoſes of real uſe as well as amuſement, be found agreeable to many. Their greateſt relation to the arts of deſign lies, however, in the article of ſtaining ſtones, from the frequent occaſion ſtatuaries, and others who work in marble and alabaſter, have to give artificial colours to them; the method of doing which, in a more perfect manner, is nevertheleſs known to very few at preſent.

Theſe are the particular topics of inſtruction contained in the firſt volume, by which this work is intended to promote the improvement of the arts, and the more curious kinds of manufactures; and excepting engraving, etching, and ſcraping mezzotintos, they comprehend moſt ſubjects that have any immediate relation to them; tho' ſome are touched upon in a more copious, and others only in a brief manner; according to the importance of the matter, or the room given for an advantageous enlargement on it.

It may probably be imagined, that the ends propoſed by this treatiſe may be anſwered by the writings of others already publiſhed, as there is more than one book in our own language, which pretend to plans not greatly different from that on which it is formed, beſides a multiplicity of others that profeſs to teach particular arts. But on a cloſer examination, I am afraid it will by no means be found that all the volumes which have been compiled on theſe heads taken together, and much leſs any ſingle one of the number, have effectually provided the information wanted, or even gone any conſiderable lengths towards it. One could ſcarcely believe, nevertheleſs, without having peruſed them, that almoſt every book already written on theſe ſubjects ſo generally intereſting ſhould be egregiouſly defective in matter, form, and veracity, and yet this is almoſt equally the caſe of all where they are treated of in a more copious and extenſive manner. But it will appear leſs extraordinary when we find, that the authors were for the moſt part unacquainted, in an experimental way, with what they took upon them to teach, and not better qualified with any ſpeculative knowledge that could enable them to judge critically of what they procured on the authority of others. They therefore either blindly copied after former writers, or added implicitly ſuch additional articles, as the reports of living perſons they inquired of furniſhed them with, and were perhaps as often deceived by the deſign as the ignorance of thoſe from whom they ſought information, being themſelves poſſibly not always very ſolicitous ſo much about the value, as the quantity of what they collected.

With reſpect to the preparation of painters colours, *Neri*, in his treatiſe on glaſs, ſeems to have laid the foundation for all the collections of recipes of that kind publiſhed here, probably from its becoming known by means of Merret's tranſlation to the writers, whoſe reading was not extenſive enough to lead them to an acquaintance with Birellus, or the paſſages in Mathiolus, Warmius, Ceſalpinus, and others who have occaſionally touched on this head.

Caneparius, in his book *De atramentis*, gave a more extenſive view of the preparation and compoſition of the pigments for painting, by adopting what Neri had given, (tho' he has never quoted him by name) and adding ſeveral more particulars omitted by him, as likewiſe a variety of other practices relating to the arts, but mixed with many erroneous and falſe accounts both of the proceſſes and the produce of them.

Merret, an Engliſh phyſician, tranſlated Neri into our language, and gave notes upon him; but not having, as appears, the leaſt light to direct him in his opinions, but what he borrowed from other writers, his obſervations neither illuſtrated nor augmented, in any material degree, the contents of Neri's book.

Kunckel republiſhed, in the German language, Neri's work with Merret's notes, and his own obſervations on both; and he alſo inſerted, as well there as in his other diſſertations on the art of making glaſs, ſeveral proceſſes for the preparation of painters colours, much better than thoſe of Neri or the others before him, as likewiſe many more uſeful recipes regarding the arts and myſterious trades. But he ſeems to be the only writer, who has treated theſe ſubjects in a more diffuſive manner, that was experimentally converſant with what he undertook to teach.

After this, *Salmon*, in his *Polygraphices*, took upon him to give inſtructions for the practice of almoſt all the arts and myſterious trades; and by the aſſiſtance of the former writers, and private information, got together a larger body of matter reſpecting theſe ſubjects than any before him had done. His collection would indeed have had conſiderable merit at the time it was publiſhed, if the valuable parts had not been confounded with ſuch a heap of abſurd ſtuff and falſities, as rendered every paſſage ſuſpicious, and diſpoſed in a manner ſo void of all order and method, that (an index being wanting likewiſe) it was impracticable, without turning over and carefully examining a great number of pages, to find any article required; though ſeveral are repeated four or five times over in different places. But the difficulty of finding what was wanted, and uncertainty whether what might be found would prove a juſt account of the matter, or ſome extravagant blunder or impoſition, diſcouraged thoſe who might have profited by many of his recipes and inſtructions, from ſeeking any aſſiſtance from him in matters of a more nice or common nature. This conduct in digeſting with ſo little care, and debaſing with impertinences and ſalſehoods, the proper matter of that work, is however no great ground of wonder in the caſe of a writer, who, after he found this book met with a good reception from the public, was capable of conſpiring with bookſellers to blend a long diſcourſe of chiromantical ſignatures, or the means of telling fortunes by the lines of the hands, and a maſs of the moſt ridiculous nonſenſe that has been written on the philoſopher's ſtone, with the contents of a treatiſe profeſſing to convey a practical knowledge of the uſeful arts, for the ſake of enlarging the volume, in order to raiſe the price, under pretence that valuable additions had been made to the work.

The laſt performance of this kind was publiſhed under the aſſuming title of the *School of Arts*; from which name one might have hoped, if not for a complete ſyſtem of knowledge of this kind, at leaſt for ſomewhat better than the earlier writers had produced; eſpecially as many amendments of the former practice, as well as the introduction into uſe of ſeveral important inventions, had furniſhed much ampler matter; but the author, inſtead of ſhunning their errors, or availing himſelf of the advantages the preſent ſtate of things gave him over them, adopted with great augmentation all the defects and faults of thoſe who had gone before him, and formed his work on a plan that deprived him of all opportunity of profiting of the greater advance towards perfection of the modern practice; for, being a German (as I conjecture from his manner of changing the Engliſh idiom) he ſeems to have conceived, that nothing could be added to the labours of his countrymen; and has, therefore, with reſpect at leaſt to thoſe topics he has touched upon in common with this work, confined himſelf to tranſlating and compiling from Kunckel, and other Germans, who being of older date, could not ſupply him with the improvements and inventions of the preſent time. In conſequence of which conduct, obſolete and inſufficient methods are taught, inſtead of the modern and effectual; and many of the moſt material articles wholly omitted. In the inſtance of gilding, all the inſtructions are confined to metals; and with regard even to them, relate only to means now exploded; and many important matters ſtrictly connected with his plan, are not once mentioned in the book, while others of much leſs conſequence, as the method of cryſtallizing ſilver under the reſemblance of a tree, are repeated four or five times over. Like Salmon, he gleaned alſo together all the extravagancies he could lay hold of, in order to increaſe the ſize of the work to the bookſeller's unreaſonable ſtandard; and therefore inſerted in his firſt volume, a moſt prepoſterous and lying account of the breeding ſilk worms by putrefied veal, and producing ſtrange ſerpents by equivocal generation; and in his ſecond volume, a diſſertation on the catching, breeding, feeding, and teaching nightingales, which takes up ſixteen pages; with a multiplicity of other ſuch wretched abſurdities in both, as greatly diſgrace the title of *School of Arts*, and conduce indeed, from their having been ſo often admitted into them, to make works of this kind in general contemptible. But what is ſtill moſt unhappy in the caſe of this author, he appears neither to have underſtood the language he tranſlated from, nor that he wrote in. Whence the recipes and obſervations he has given are ſo ill delivered, by his miſtaking the ſenſe of technical terms, and putting the name of one thing for another, with reſpect even to ſubſtances, as, together with the alterations he has had the vanity to make in them, from the manner they were given by thoſe he took them from, according to his own groſs miſconceptions, render them frequently unintelligible, and not to be depended upon in many inſtances.

The pretenſions of the oſtentatious works, the Cyclopedias, and Encyclopedias, and other ſuch dictionaries, have not been, however, much more made good than thoſe of the *School of Arts*. For, indeed, it is ſurpriſing how ſhamefully ſilent theſe books, which profeſs to comprehend every thing relating to ſubjects of this kind, are with reſpect to moſt of the eſſential articles; even thoſe where the writings of others, had they been induſtriouſly conſulted, would have furniſhed what was required. Nor is the French Dictionary now publiſhed in the leaſt an exception to this;

for, on examining it, in order to have informed myſelf of the methods practiſed by the French, with reſpect to certain particulars in which they excel, I was ſurpriſed to find, that, in ſome caſes, every thing concerning them was entirely omitted, and in others, recipes, or other paſſages, taken from ſome of the old books with the moſt injudicious choice, ſupplied the place of the juſt account of the improved methods obtained from the ableſt practitioners of the ſeveral arts, which, in the propoſals for this work, were promiſed to have been given. There is, among many others, a glaring inſtance of this in the article *Carmine*; which pigment, being prepared at Paris in much greater perfection than any other place at preſent, and of the greateſt conſequence in painting with water colours, was well worth the attention of the compilers of this work. But, inſtead of any account of the modern and efficacious practice of the preparation of carmine, which is not moreover a ſecret in the hands of a ſingle perſon, but known to ſeveral who make it together with other colours; all that is inſerted on this head, conſiſts of three recipes taken from the old writers; two of which contain only directions for doing what will be barren of any uſeful product; and the other a bad proceſs taken from Kunckel for making lake of Braſil wood, which is, nevertheleſs, praiſed as the communication of an excellent method of making carmine. I was indeed diſappointed in my expectations from that work, with relation to this important article, as it has never been in my power to diſcover by experiments, or procure by information, the knowledge of the means of preparing carmine of equal goodneſs with that of the French. But I chooſe much rather to acknowledge my ignorance in this point, than, like the preceding writers, to give methods which are inferior to thoſe of the improved practice, or to obtrude abſurd and fruitleſs proceſſes on the public, in the place of the proper and effectual.

I am ſenſible, I run ſome hazard of a retaliation, in canvaſſing thus freely the performances of others, ſince doubtleſs my own is not exempt from errors and defects. But I thought it a neceſſary vindication of theſe kinds of writings, and of my own undertaking in particular, to ſhew, that the cauſe of the diſregard, or even contempt, in which the greateſt part of the books of this kind are held by the more judicious, did not ariſe from the nature of the ſubject, but the faulty manner of treating it, through the inſufficiency and venality of the authors. And with reſpect to my own miſcarriages, I am ſo little conſcious of having occaſioned them, either by neglect, or a mercenary conduct, that I am not in the leaſt diffident of truſting my work to the candour of the impartial, who will excuſe ſome miſtakes and omiſſions, which, in taking ſo great a ſcope of ſubject, it is almoſt impoſſible to avoid, on the ſcore of ſo many uſeful articles as will be found to be inſerted; for, with reſpect to the far greateſt part, I can avouch them to be authentic and juſt, either from my own experiments and obſervations, the information of perſons of undoubted veracity who have practiſed them, or clear deductions from unqueſtionable principle.

Beſides the articles mentioned above, there is a number of others of conſiderable importance added in this edition, and many of thoſe contained in the firſt are alſo illuſtrated, or altered, where late improvements, or more extenſive information have given occaſion to it. The value of the work is therefore conſequently enhanced, as well as the volume enlarged; but the editor, notwithſtanding the additional expence, has continued the book at the original price, deviating from the practice of former publiſhers of ſuch treatiſes, who, when they have met with encouragement from the public, in the ſale of one impreſſion, have augmented the book with whatever matter they could find, in order to have a pretence to advance its price.

CONTENTS.

PART I.

Of the *MATERIA PICTORIA*; or, the nature, preparation, and uſe of all the various ſubſtances employed in *painting*.

CHAP. I.

OF the ſubſtances in general uſed in painting. p. 1.

CHAP. II.

Of colours.

SECT. I. *Of colours in general.* 3
SECT. II. *Of the utenſils, inſtruments, &c. ſubſervient to the making and preparing colours.* 13
SECT. III. *Of the general operations ſubſervient to the making or preparing colours.* 31
SECT. IV. *Of the nature and preparations of particular colours.* 43

CHAP. III.

Of the vehicles, dryers, and other ſubſtances uſed in painting for the laying on and binding the colours.

SECT. I *Of the vehicles, dryers, &c. in general.* p. 144
SECT. II. *Of oils in general.* 150
SECT. III. *Of particular oils.* 154
SECT. IV. *Of particular dryers.* 158
SECT. V. *Of the ſubſtances uſed for rendering water a proper vehicle for colours* 165
SECT. VI. *Of the ſubſtances uſed to render ſpirit of wine a vehicle for colours* 169

CHAP. IV.

Of the manner of compounding and mixing the colours, with their proper vehicles, for each kind of painting.

SECT. I. *Of the colours proper to be uſed with oils, and the manner of compounding and mixing them with the oils and dryers.* 173
SECT. II. *Of the ſeveral methods of painting in water, as diſtinguiſhed by the colours, vehicles, and grounds, required for different purpoſes.* 177
SECT. III. *Of the colours to be uſed in the* PAINTING WITH WATER COLOURS, *or in* MINIATURE; *with the manner*

manner of mixture, or compoſition of them, with their proper vehicles p. 178
SECT. IV. *Of the colours fit to be uſed in diſtemper, or painting with ſize, and the manner of mixing and compounding them with the proper vehicles.* 187
SECT. V. *Of the colours proper to be uſed in freſco painting, and the mixture of them with the water.* 189
SECT. VI. *Of the colours proper to be uſed in varniſh painting, and the manner of mixing and compounding them with the proper vehicles.* 190

CHAP. V.

Of the nature and preparation of paſtils or crayons. 195

CHAP. VI.

Of the grounds for the ſeveral kinds of painting.

SECT. I. *Of the grounds for oil painting.* 216
SECT. II. *Of the grounds for painting in water colours, or primitive painting,* 220
SECT. III. *Of the grounds for painting in diſtemper.* 222
SECT. IV. *Of the grounds for painting in freſco.* 223
SECT. V. *Of the grounds for varniſh painting.* 224

CHAP. VII.

Of the methods of varniſhing and preſerving pictures and paintings. p. 224

CHAP. VIII.

Of mending and cleaning pictures and paintings.

SECT. I. *Of mending pictures.* 234
SECT. II. *Of cleaning pictures and paintings* 236

CHAP. IX.

Of the nature, preparation, and uſe of the ſeveral ſubſtances employed in ENCAUSTIC painting.

SECT. I. *Of the general nature of encauſtic painting.* 245
SECT. II. *Of the grounds uſed in encauſtic painting.* 247
——— *Of the colours to be uſed in encauſtic painting.* 253
SECT. III. *Of the manner of fixing the colours in the practice of painting in encauſtic.* 257
SECT. IV. *Of the manner of painting with crayons in encauſtic.* 259

CHAP.

CHAP. X.

Of the nature, preparation, and uſe, of the ſeveral ſubſtances employed in enamel painting.

SECT. I. *Of the general nature of enamel painting* p. 261

SECT. II. *Of the aparatus, or ſet of utenſils for the preparing and laying on the grounds and colours in enamel painting* 266

SECT. III. *Of the general nature and application of the ſubſtances uſed in enamel painting, with their previous preparation* 278

SECT. IV. *Of the compounding and preparing the fluxes for enamel painting.* 322

SECT. V. *Of the compoſition and preparation of white enamel for grounds and other purpoſes* 330

SECT. VI. *Of the compoſition of the colouring ſubſtances, together with the proper fluxes, in order to the painting with all the variety of colours in enamel.* 336

SECT. VII. *Of the manner of laying on and burning the enamel grounds.* 355

SECT. VIII. *Of the manner of laying on and burning the enamel colours.* 361

CHAP. XI.

Of the method of painting on glaſs by burning, or with tranſparent colours that vitrify.

SECT. I. *Of the general nature of painting on glaſs with vitreous colours* p. 362
SECT. II. *Of glaſs as a ground for painting with vitreous colours, or by burning.* 365
SECT. III. *Of the fluxes and colours to be uſed in painting on glaſs by burning.* 367
SECT. IV. *Of the manner of laying the colours on glaſs grounds, and burning them.* 371

CHAP. XII.

Of gilding enamel and glaſs by burning. 374

CHAP. XIII.

Of the taking off mezzotinto prints on glaſs, and painting upon them with oil, water, or varniſh colours. 379

CHAP. XIV.

Of colouring or waſhing maps, prints, &c. 381

PART. II.

Of the ſeveral arts uſed in making outline ſketches of deſigns from nature, or depicted repreſentations; and of the means of taking caſts and impreſſions from figures, buſts, medals, leaves, &c.

CHAP. I.

Of the devices employed for the more eaſily obtaining a juſt outline in making deſigns from nature, and the various methods of off-tracing, calking, and reducing pictures, prints, or drawings. p. 385

CHAP. II.

Of the means of taking caſts and impreſſions, from figures, buſts, medals, leaves, &c. 404

PART III.

Of gilding, ſilvering, bronzing, japanning, lacquering, and the ſtaining different kinds of ſubſtances, with all the variety of colours.

CHAP. I.

Of gilding.

SECT. I. *Of gilding in general.* 421
SECT. II. *Of the inſtruments that are common to the oil, burniſh, and japanners gilding.* 424
SECT. III. *Of the manner of oil gilding, and the preparation of fat oil.* 426

SECT.

SECT. IV. *Of burniſh gilding, with the preparation of the proper ſizes, &c.* p. 431
SECT. V. *Of japanners gilding.* 438
SECT. VI. *Of gilding paper and vellum, or parchment.* 444
SECT. VII. *Of gilding leather.* 453
SECT. VIII. *Of gilding glaſs without annealing or burning.* 469

CHAP. II.

Of ſilvering. 471

CHAP. III.

Of bronzing. 476

CHAP. IV.

Of japanning.

SECT. I. *Of japanning in general.* 479
SECT. II. *Of japan grounds.* 483
SECT. III. *Of painting japan work.* 495
SECT. IV. *Of varniſhing japan work.* 496
SECT. V. *Of gilding japan work.* 501

CHAP. V.

Of lacquering. 502

CHAP.

CHAP. VI.

Of ſtaining wood,—ivory, bone, and horn,—paper, and parchment,—alabaſter, marble, and other ſtones, of various colours.

SECT. I. *Of ſtaining wood.* p. 508
SECT. II. *Of ſtaining ivory, bone, or horn.* 515
SECT. III. *Of ſtaining paper or parchment, of various colours.* 519
SECT. IV. *Of ſtaining alabaſter, marble, and other ſtones, of various colours.* 521

ADVERTISEMENT.

IF any word occur in the contents of the following pages, which may not be underſtood by the reader, on conſulting the index, a reference will be always found to ſome place where it is fully explained; this work being intended, along with other purpoſes, to anſwer that of a gloſſary to the technical words and expreſſions, relating to the ſubjects treated of, peculiar to painters and other artiſts.

PART I.

OF THE MATERIA PICTORIA:

OR,

The nature, preparation, and uſe of all the various ſubſtances employed in painting.

CHAP. I.

Of the ſubſtances in general uſed in painting

THE principal kind of ſubſtances uſed in painting is the *COLOURS*: by which is to be underſtood, all the various bodies employed by painters, for producing the difference of hue or teint. But, as ſeveral of theſe are of a ſolid conſiſtence, and an earthy or incohering texture, it was neceſſary, as well for the laying them on, and ſpreading them properly, as for the binding and making them adhere to the grounds on which they are laid, that, in many caſes, ſomewhat of a fluid nature ſhould be added to give them an unctuous conſiſtence while uſed, and a proper degree of tenacity when again dry.

To this end, many different kinds of bodies have been applied; from whence proper *VEHICLES* have been formed, which, at the ſame time, anſwer the double purpoſe of reducing the colours to a ſtate fit for their being worked with the bruſh or pencil, and of cementing them to each other and the ground they are laid upon; as alſo defending them from being eaſily injured by accidents.

The ſubſtances uſed in painting may be therefore all conſidered as of theſe two kinds; *Colours* and *Vehicles*. For, though there are ſeveral uſed occaſionally, which are not immediately ſubſervient to the principal intentions of vehicles; yet, being employed to remedy the defects of thoſe which are, they muſt be deemed as ſubordinate to them; and ought, conſequently, to be claſſed with ſuch as compoſe vehicles.

The nature of theſe ſecondary intentions I ſhall, therefore, point out in its due place; and reduce the ſubſtances ſerving to them to their proper claſſes accordingly. As it is neceſſary, in order to underſtand critically and completely the art of preparing and uſing the various articles of the *materia pictoria*, to comprehend clearly the general intention in which each is uſed, as well as to know the particular purpoſe to which it is applied. And, for the ſame reaſon, as alſo for the ſake of being intelligibly conciſe, I ſhall treat of the whole under ſuch methodical diſtinctions as refer to theſe intentions; adopting, nevertheleſs, on every occaſion, the terms of art in common uſe; and explaining them, according to the meaning they bear, when applied with any propriety or preciſion, by the particular relation they have to theſe intentions.

CHAP. II.

Of Colours.

SECT. I. *Of colours in general.*

COLOURS may be either *PIGMENTS* or *FLUIDS*. By *pigments*, is meant all ſuch ſolid bodies as require to be mixed with ſome fluid, as a vehicle, before they be employed as paints (except in the caſe of crayons, where they are uſed dry). Theſe make the far greateſt part of the whole; the fluid colours being only a ſmall number of aqueous tinctures, which come into the claſs of water colours; and aſphaltum, a bituminous ſubſtance, which is ſometimes employed in oil painting.

Colours are diſtinguiſhed into ſeveral kinds, according to the vehicles in which they are worked: as *oil colours*, *water colours*, *enamel colours*, &c. The ſame ſorts of pigments, being however, as in many inſtances, employed in more than one kind of painting, as vermilion and lake in ſeveral, and ultramarine in all, I ſhall not diſtribute them into claſſes, in that view, till I come to ſpeak of their particular application; but treat at preſent of them promiſcuouſly in teaching their general nature and preparation; dividing them according to their affinity in colour only. As this method of arrangement will not only render each article more eaſy to be found; but, at the ſame time, exhibit, to the artiſt, together, the whole ſtock of every kind from whence he muſt take what he wants on each occaſion; by which, he will be the more enabled to chooſe what may beſt ſuit his particular purpoſe. For the ſame reaſon, alſo, this method is certainly more expedient than the diſpoſing them in claſſes, according to their natural relation to each other, as earths, minerals, vegetables, &c. which would lead to the like kind of confuſion and repetition.

The principal qualities in colours, conſidered with regard to their perfection or faultineſs, are two; *purity of colour* and *durableneſs*. Purity of colour is, by the painters, called *BRIGHTNESS*; and the defect of it, *FOULNESS*, or ſometimes the *BREAKING THE COLOUR*. Durableneſs is called *STANDING*; and the negation or want of it *FLYING*, or *FLYING OFF*. Theſe terms, for conciſeneſs, I ſhall uſe in ſpeaking of theſe qualities.

Brightneſs and *ſtanding* well are the only properties which are neceſſary to the perfection of every kind of colours; and they equally relate to all; but there are others which are eſſential to many ſorts, with regard only to particular purpoſes and uſes. Such of them, however, as do not fall within the general conſideration of the nature of colours, will be treated of in thoſe parts of the work where the particular uſes of colours come in queſtion.

The moſt conſiderable of the more general properties of colours, after *purity* and *durableneſs*, or *brightneſs* and *ſtanding well*, are tranſparency and opacity: for according to their condition, with reſpect to theſe qualities, they are fitted to anſwer very different kinds of purpoſes. Colours which become tranſparent in oil, ſuch as lake, Pruſſian blue, and brown pink, are frequently uſed without the admixture of white, or any other opake pigment. By which means, the teint of the ground on which they are laid retains, in ſome degree, its force; and the real colour, produced in the painting. is the combined effect of both. This is called *GLAZING:* and the pigments, indued with ſuch property of becoming tranſparent in oil, are called *glazing colours.* The ſame holds good alſo of ſuch colours as are tranſparent in water: only when they are there uſed in this manner, they are not called *glazing* but *WASHING* colours. When colours have no degree of ſuch tranſparency in the vehicle in which they are uſed, as vermilion, King's yellow, and ſeveral others, they are ſaid *TO HAVE A BODY* and *TO COVER.* The property of *glazing* or *waſhing* is of ſo much importance, both in oil and water, that no other method can equally well produce the ſame effect in many caſes, either with regard to the force, beauty, or ſoftneſs of the colouring. It is therefore very eſſential to the perfection of ſeveral kinds of pigments that they ſhould poſſeſs this property in a complete degree; but, in other inſtances, the uſing colours with a ſtrong body is not leſs neceſſary, eſpecially for the grounding or *laying* in, as it is called, of many objects to be painted.

There is another material quality in colours, that relates only to their uſe in oil, which is the *drying* well and (as it is called) not *fattening.* By *FATTENING* is meant, a coagulation of the oil, that frequently happens on its commixture with ſeveral kinds of pigments, by the effect they have upon it; from whence, after ſome time keeping, it is rendered of ſo viſcid or glutinous a conſiſtence, as to be wholly incapable of being worked with either bruſh or pencil. This quality, when found in them, deſtroys almoſt wholly the value of ſuch pigments for the purpoſes of the colourman. As they ſell a great part of them ground with oil, and tied up in pieces of bladder, where they are kept till there is a demand for them, which frequently does not happen ſoon; and, therefore, gives time for their ſpoiling in conſequence of this quality. But to painters, who mix the colours for themſelves, on their palettes, with the oil, this property is not an equal inconvenience, when in a leſſer degree. Only, in general, it muſt be obſerved, that colours, in proportion to their tendency to fatten, are ſlow in drying; and when the oil once contracts this ſtate, it will be a very long time before it will become duly hard and firm in the paintings.

There are two other qualities of colours in general that relate only to their teint or hue; but which render them nevertheleſs fit or improper, in a very material degree, for different purpoſes. They are diſtinguiſhed by the names of *WARMTH* and *COOLNESS:* terms which indeed are uſed very frequently by painters; but for the moſt part, very indefinitely, and without any preciſe or clear meaning. What is meant, when properly uſed, by warmth, is that fiery effect which a ſmall addition of yellow gives to a true red; and that glowing appearance which red imparts to either yellow or blue. By *warmth*, therefore, in red, is to be underſtood a ſmall inclination towards orange; by the ſame term, applied to yellow, a like tendency by the admixture of red; and, by the ſame, again in the caſe of blue, muſt be underſtood its ſlightly verging on the purple. By *coolneſs*, is to be underſtood, the oppoſite to warmth. But this term is ſeldom uſed, except in ſpeaking of yellow and blue; and there it means either the negation of that which cauſes warmth, or a tendency to green, in either colour, by a ſlight admixture of the other.

The ſenſe of the word *warmth*, when applied to colouring or the combined appearance of various teints, muſt not be confounded with that which it has when ſpeaking of particular colours. For there it relates to the producing a ſtrong effect, by the diſpoſition or contraſt of the colours, or the groſſneſs of the teints; and not the qualities peculiar to, or inherent in the colours themſelves.

The colours which may be uſed in all the ſeveral kinds of painting, except ſome peculiar to enamel, are as follow:

CLASS I.

RED.	Vermilion.	*Scarlet, or tending to the orange.*
	Native cinnabar.	
	Red lead.	
	Scarlet ochre,	
	Common Indian red.	
	Spaniſh brown.	
	Terra di Sienna burnt.	
	Carmine.	*Crimſon, or tending to the purple.*
	Lake.	
	Roſe pink.	
	Red ochre.	
	Venetian red.	

CLASS II.

BLUE.	Ultramarine.
	Ultramarine aſhes.
	Pruſſian blue,
	Verditer.
	Cendre blue; or, ſanders blue.
	Indigo.
	Smalt.
	Bice.
	Litmus; or, lacmus.

Class III.

YELLOW.

King's yellow.
Naples yellow.
Yellow ochre.
Dutch pink.
Engliſh pink.
Light pink.
Gamboge.
Maſticot.
Common orpiment.
Gall ſtone.
Terra di Sienna unburnt.
Turbith mineral.
Yellow-berry waſh.
Turmeric waſh.
Zedoary waſh.
Tincture of ſaffron.

Class IV.

GREEN.

Verdigriſe.
Diſtilled verdigriſe; or, cryſtals of verdigriſe.
Pruſſian green.
Terra verte.
Sap green.

Class V.

ORANGE.

Orange lake.

Class VI.

PURPLE.

True Indian red.
Archal.
Logwood waſh.

Class VII.

BROWN.

Brown pink.
Biſtre.
Brown ochre.
Umbre.
Cologn earth.
Aſphaltum.
Spaniſh juice; or, extract of liquorice.
Tobacco water.

CLASS VIII.

WHITE.
White flake.
White lead.
Calcined hartſhorn.
Pearl white.
Troy white.
Egg-ſhell white.
Flowers of biſmuth.

CLASS IX.

BLACK.
Lamp black.
Ivory black.
Blue black.
Indian ink.

Theſe are all the colours at preſent in uſe, in this country, in any kind of painting, except ſuch as are peculiar to enamel. In which method of painting, as but few of them are capable of combining with glaſs, and enduring the neceſſary heat without changing their nature, or being deſtroyed, others are employed more ſuitable to vitrification. On which account, as the compoſitions for forming the enamel colours are very various, and bear no particular names, and the management of them has very little relation to other kinds of painting, I ſhall omit ſpeaking of them till I come to treat particularly of enamel painting.

Of the above enumerated colours, but few are in univerſal uſe; moſt painters having only a ſelect ſet out of them, and being, in general, unduly prejudiced againſt thoſe they reject. And ſome of the beſt of them, as ſcarlet ochre, *terra de Sienna*, *terra verte*, true Indian red, and umbre in oil painting, and biſtre and gall ſtones in water painting, are, either through their ſcarcity, or the ignorance which prevails concerning their qualities, at preſent very little regarded; though ſome of them were formerly in common uſe; and all of them might be ſo with great advantage to the art.

It is no little impediment to their improvement in the profeſſion, that painters are not more extenſively acquainted with all the ſubſtances fit for their purpoſes; and more minutely informed of the good as well as the bad qualities of what colours they might uſe. For many labour under great diſadvantages for want of a more copious choice, and the not being better apprized of ſome of thoſe which ſuit their own particular manner of working; as it would, in many caſes, remove difficulties out of their way, by enabling them to produce effects by more ſimple methods, and ſuch as are alſo more correſpondent to their manner, than thoſe they are now obliged to purſue from their defect of proper colours.

As colours are obtained from very various ſubſtances, the means of preparing them are, conſequently, very various: ſome being of a ſimple nature, and requiring only to be purified, and reduced to a proper conſiſtence or texture; and others being compounds of different bodies, to be formed only by complex and elaborate proceſſes. It is therefore very difficult to give ſuch general directions, for the making every ſort of colour, as may be intelligible to all; the utenſils to be employed, as well as the methods to be purſued, being ſuch as belong to different arts and trades. But as the greater part may be done moſt commodiouſly by adopting the methods uſed for performing the common chymical proceſſes, it is the moſt expedient way to treat of them correſpondently to ſuch a view. As by that means, any who may make themſelves acquainted with the common practice of chymiſtry, for which there are a number of books that afford ſufficient aſſiſtance, may eaſily underſtand the whole art of making colours, when taught in this manner. For the ſake, however, of thoſe who may want leiſure or diſpoſition to proceed by this method, I will prefix ſuch a deſcription of the inſtruments, and explanation of the general nature of the operations, as, together with the particular directions given in each proceſs, may enable even ſuch as are wholly ignorant of chymiſtry, if they give a due attention, to get over this difficulty. As indeed, without ſuch a previous knowledge of the nature of the inſtruments and operations, it would be impracticable to attempt to prepare ſeveral of the moſt valuable colours.

Where, nevertheleſs, ſimple means, and the uſe of ſuch utenſils as are generally known, may be ſufficient to perform what is wanted, I ſhall avoid all technical terms, and more complex methods of operation; confining myſelf to ſuch a manner of inſtruction as may be univerſally intelligible.

SECT. II.

Of the utenſils, inſtruments, &c. ſubſervient to the making and preparing colours.

THE apparatus or ſet of utenſils, &c. neceſſary for making the ſeveral colours uſed by painters, conſiſts of a furnace for ſubliming vermilion;—another for ſubliming King's yellow;—a third for calcining ultramarine, the coal for Pruſſian blue, ochres, &c.—ſublimers;—a pewter boiler with its proper furnace;— a *balneum mariæ*;—filters;—boards for drying the pigments;—levigating mills, mortars and peſtles, ſtones and mullars; with ſeveral other ſmaller implements ſubſervient to theſe.

As ſeveral of theſe implements are in common uſe for other purpoſes, and conſequently to be had ready made of a proper conſtructure, I ſhall only enumerate them, without entering on any particular deſcription of them: but with reſpect to that part of the apparatus which relates to the more ſecret arts of making ſeveral of the colours, and has any thing peculiar in its fabrication, I will endeavour to give ſuch a conception of the proper figure of every particular, and ſuch directions for their conſtruction, as may enable any to procure them to be made by proper workmen. Since, without

out this previous information of the neceſſary means of performing them, the giving the recipes or proceſſes alone for making the colours would be of very little conſequence: and as, moreover, by this method, I avoid the neceſſity of repeating frequently the inſtructions for thoſe particulars, which when given in a more general way will ſerve effectually for a multiplicity of occaſions.

The furnaces are of the moſt difficult conſtruction of any part of the apparatus for making colours; being moſt remote from common experience and conception, and yet it is indiſpenſibly requiſite that they ſhould be completely adapted to the purpoſe they are intended for. I ſhall therefore be very particular in my directions concerning them; but, before I enter on that taſk, it may be previouſly neceſſary to teach the manner of making a compoſition, which I ſhall have occaſion to direct the uſe of frequently in my inſtructions for the building them, as well as on other occaſions. I mean the lute for making good the junctures that ſuffer a great heat, and ſecuring bodies of a tender nature from the effects of the fire. This I ſhall call here, as is done elſewhere, the *fire-lute*; the compoſition of which is as follows:

" Take of green vitriol, or copperas, any
" quantity; and put it into an earthen pipkin,
" of which it may fill only three parts. Set
" it on a common fire, taking care that it
" may not boil over, which will be very li-

"able to happen if the fire burn too briſkly. "When it has almoſt done boiling, throw in "more of the vitriol, the quantity at firſt "thrown in being now ſhrunk and contracted; and let that alſo boil to dryneſs; repeating this till the pipkin be near full of "the dried matter. Raiſe the fire then round "it, and let it continue in as ſtrong a heat as "can be conveniently made, till the whole "contents become of a red colour; after which "take the pipkin out of the fire; and, being "cold, break it, and ſeparate the calcined "vitriol from it. Take then of this calcined "vitriol, powdered, two parts, of the *ſcoria* or "clinkers of a ſmith's forge, finely levigated, "—Sturbridge clay or Windſor loom, dried "and powdered,—and fine ſand, each one "part: mix them well together, and then "temper them, with the blood of any beaſt, "till they become of the conſiſtence of mortar; a twentieth part of the weight of the "whole of ſhort hair being beaten up with "them."

The ſeveral furnaces neceſſary for making the finer kinds of colours are; thoſe *for ſubliming cinnabar for making vermilion;—for ſubliming King's yellow; and for calcining blood for making Pruſſian blue*, *ochre*, *ultramarine*, &c.

The FURNACE FOR VERMILION, as well as the operation to be performed in it, are of the moſt nice nature of any objects relating to the art of making colours: it is indeed ſo difficult a thing to manage well the manufacture of vermilion,

milion, that it is given up in general in this country, even when the price of quickſilver would make it very profitable; and the greateſt part, if not the whole of the conſumption, is ſupplied from Holland: but if any will prepare well the apparatus, as here directed, and execute properly the proceſs given below, they need not doubt, with ſome experience, but to be able to carry on this manufacture as well as the Dutch. The manner of conſtructing the furnace may be as follows:

The firſt ſtep muſt be to procure the proper iron-work, which conſiſts of bars for bearing the fuel,—a frame,—the doors for lighting the fire,—a ſtrong plate for ſupporting the brick-work over them,—an iron frame and ſtopper for feeding the fire,—and an iron ring for laying over the top of the furnace, for the better hanging the bodies or ſubliming veſſels in it.

The bars ſhould be of hammered iron, eight in number, eight inches in length, a quarter of an inch in breadth, half an inch in depth, and fixed firmly by each end, at the diſtance of a quarter and an half quarter of an inch from each other, into two ſtrong croſs-bars; which croſs-bars muſt be ſufficiently long to admit of their ſuffering the brick-work to have good hold of them; and muſt be made flat at their ends, on that account.

The frame and door muſt be alſo of hammered iron. They may be of the length of the area or fire-place as formed by the bars;

but

but need not be more than four inches high. They ſhould be of the uſual form of thoſe made for the furnaces of coppers, but ſtronger; and it is better to have the latch bigger than is common, and carried acroſs the whole door; which will give it ſtrength to reſiſt the weight of the fuel, that otherwiſe, when the iron is ſoftened by violent heat, is apt to force the middle part outwards.

The iron bar to lay acroſs the frame of the door may be three inches in breadth, and about three inches longer than the frame itſelf; it may be either of caſt or hammered iron, as ſhall be moſt eaſy to be procured.

The frame and ſtopper for feeding the fire ſhould be alſo of hammered iron; the frame may be four inches long, and three inches high. It may be formed of four plates of a moderate ſtrength; of which thoſe of the top and bottom muſt ſlope downwards towards the fire in a parallel; they muſt alſo project beyond their joining with the ſide plates, in order to their being fixed in the brick-work. The ſtopper muſt be formed of five plates, put together in faſhion of a box, (as in the doors of portable iron furnaces) and of ſuch figure and proportion as to ſlide into the hole formed by the frame, and fill it up exactly, ſo as to render that part of the furnace intire, when it is not taken out occaſionally to feed or ſtir the fire. The hollow of this box or ſtopper muſt be turned towards the fire, and filled with fire-lute; and a handle muſt be fixed in the middle of the outward part, for the more commodious uſe of it when hot.

The iron ring for hanging the bodies or ſubliming veſſels in the fire muſt be made of caſt iron. It ſhould be of about four inches depth, and of a conic form, converging outwards. It ſhould have an outward rim, or margin turning off from the ring horizontally, in order to its lying on the brick-work of the furnace. The diameter of the ring muſt be in proportion to the ſize of the ſublimers to be hung in it: it ſhould be about two inches wider in the lower parts than their diameters; and muſt diverge or inlarge itſelf upwards half an inch.

The iron-work being thus prepared, and a proper quantity of Windſor bricks, and the loam they are made of, or Sturbridge clay, as well as common bricks, and coal-aſh, and common mortar, provided, the dimenſions of the furnace muſt then be thus ſettled:

Take the diameter of the greateſt ſublimer intended to be worked in it, and add to it two inches to allow for the lute, if any ſhould be uſed round it; then add twenty-two inches, and it will give the diameter of the whole area of the furnace.

The dimenſions of the furnace being thus ſettled, the ground-plan muſt be made in the following manner:

A round of bricks muſt be laid of the diameter of the area of the whole fabric as ſettled above, and the bars muſt be laid in the centre of it, in their proper poſition; and a line drawn cloſe at the back of the furthermoſt croſs-bar, which muſt begin a quarter of an inch beyond the inſertion of the outermoſt of the long bars on one ſide, and extend to a quarter of an inch beyond the outermoſt bar on the other ſide. From the extremity of this line, two others muſt be drawn, parallel to the ſides of the outermoſt bars, and extended to the circular line which marks the area of the whole fabric. The ground plan being ſo marked, a cylinder of brick-work muſt be raiſed in this circle, leaving a hollow ſquare within the lines formed as above for the area of the fire-place and aſh-hole. This cylinder muſt be carried up about eight inches, and may be built of common bricks and coal-aſh mortar; but they muſt be laid ſolid, that the whole maſs may not ſhrink when ſubjected to a great heat. When this cylinder of brick-work is raiſed, the bars of the fire-place muſt be laid over the innermoſt part of the vacuity left for the aſh-hole; and the door, with its frame, muſt be alſo placed in their proper poſition in the front of the bars, which will not be, in this manner of conſtruction, on a level with the exterior ſurface or front of the furnace, as in thoſe of the common kind, but only half the length of the bars from the centre of the whole furnaces. The brick-work muſt be then again carried up ſix inches higher, in the ſame manner as before; only it muſt be made to take proper hold both of the croſs-bars of the fire-grate and the frame of the door; but in this part of the fabric the courſes next the fire ſhould be of Windſor bricks, and laid in Windſor loam, or Sturbridge clay.

The fabric being raiſed to this height, the iron plate prepared for that purpoſe muſt be laid over the opening of the brick-work, from the top of the door-frame to the exterior ſurface of the fabric, that the brick-work may be carried intirely round about, and the cylinder of brick muſt be again proceeded with as before; only it muſt be now continued intirely round, forming only an area in the middle, which muſt be made ſloping from that which is to hold the fuel, and muſt inlarge itſelf in ſuch manner that in raiſing the furnace eight inches high the diameter of the cavity may be equal to the diameter of the ſubliming veſſel, with the addition of ſix inches, to allow for the ſpace in which the fire muſt come round it on each ſide.

In the laſt courſe of bricks which raiſe the fabric to this height, the hole muſt be left for fixing the frame that is to form the opening for feeding the fire; which muſt be accordingly placed in it in ſuch manner that the ſlope formed by the upper plates, which compoſe it, may incline towards the fire. The proper ſituation for this hole is in the front of the furnace, over the opening leading to the door of the aſh-hole.

From this height the brick-work muſt be carried up, forming a hollow cylinder for four inches more, when a courſe of bricks, of which the inner ends are cut ſloping, muſt be laid ſo as to contract the circle of brick-work to the diameter of the iron ring for ſupporting the ſublimer, which muſt be then let into this opening left at the top of the furnace, and fixed with fire-lute; the bricks ſurrounding it being well pointed with the ſame. This part of the furnace, from the fire-place to the top, ſhould be intirely built of Windſor bricks, laid with Windſor loam or Sturbridge clay.

In the laſt courſe of bricks muſt be left an opening of four inches length for venting the ſmoke into the chimney; over which opening an iron plate muſt be laid, and carefully pointed with fire-lute, that the air may have no acceſs to ſpoil the draught. The chimney may be about ſixteen or eighteen feet high, and the hollow about ſix inches ſquare, or of an area equal to that, and need not be built of a greater thickneſs of bricks than is neceſſary in order to its ſupporting itſelf.

The FURNACE FOR SUBLIMING KING'S YELLOW muſt have a ſand-pot, as the heat of the naked fire would be too great. This pot may be of a greater or leſs ſize, according to the quantity of the King's yellow propoſed to be made; but where there is no particular convenience in varying from it, the ordinary ſize will be found moſt commodious.

The ſand-pot being procured, as likewiſe the reſt of the iron-work, according to the preceding directions given for the furnace for vermilion, except the iron ring for the top of the furnace, which in this caſe muſt be changed into a flat rim of caſt iron of four inches breadth, with a groove to receive the pot, and ſupport it hanging in the furnace, the plan of the furnace muſt be made out in the following manner. The diameter of the pot being firſt taken, ſix inches muſt be added to it, for the cavity to admit the fire to come round the pot, and the length of two bricks to allow for the thickneſs of the ſides of the furnace: theſe being put together, give the diameter of the whole furnace. To find the due height, the depth of the pot muſt be firſt taken; to which muſt be added ten inches for the diſtance betwixt the pot and the bars; eight inches for the diſtance of the bars from the ground, with the height of a brick for a courſe that muſt be carried round the edge of the pot; which being all put together, give the height. The building may be then carried on, in the ſame manner as was before adviſed for the furnace for vermilion, till all be completed but the laſt courſe; and the rim muſt be then laid on the top of the brick-work, and well pointed with fire-lute: after which, when theſe parts of the furnace are ſo dried as to hold well together, the pot ſhould be let down into the furnace, where it will hang by its margin or turned edge, reſting on the groove made for it in the iron rim; and another courſe of bricks muſt then be raiſed, in a continued line with the ſides of the ſand-pot, that part of them which touches the pot being laid in fire-lute.

The FURNACE FOR CALCINING THE PRUSSIAN BLUE, OCHRE, ULTRAMARINE, &c. may be of that kind commonly called a wind-furnace; and may be conſtructed in the following manner: Firſt, prepare a ſet of bars, which may be a foot in length, and ſixteen in number, with a ſtrong frame and door, of which the breadth muſt equal that of the bars, and the height be a foot; as alſo a plate, or two ſtrong flat bars, to ſupport the brick-work over the door-frame, and another to ſupport the brick-work over the aſh-hole. A foundation or pedeſtal of bricks muſt then be raiſed about three feet and a half high, and two feet four inches ſquare; which may be done with common bricks and mortar; and need only, indeed, be four walls; the hollow formed by which may be filled up with rubbiſh, and floored over with bricks or tiles. On this pedeſtal, raiſe three other walls; one on each ſide, and one at the furthermoſt end, of the whole brick thickneſs, forming an aera betwixt them, of the length of a foot, and of the breadth of ten inches; of which area the front will neceſſarily be open, from the default of the fourth wall. Over this opening, in the front, lay the bars in the centre of the brick-work, and place along with them a plate that will reach from their edge to the extremity of the furnace, to bear the brick-work which muſt lie over that part of the hollow. Then carry up the ſides as before, but with four walls inſtead of three, to incloſe the area of the fire-place intirely, taking care that the firſt courſe have good hold of the flat ends of the croſs-bars.

This part muſt riſe eight inches above the bars, and then the door and frame muſt be fixed, and the other ſides carried up as before.

When the building is carried to the height of the door and frame, the ſtrong plate muſt be laid to bear the brick-work over it; and the hollow muſt then be made to converge, till it become ſo narrow as to form a chimney, of which the area of the cavity may be ſix inches ſquare, or it may be turned into a funnel, or flue, to communicate with any other chimney, if ſuch there be ſufficiently near. But, as a wind-furnace demands a very conſiderable draught, if the flue be made from it into the chimney of any other furnace, which may not happen to be at work when there is occaſion to uſe this, care muſt be taken to ſtop the chimney of the other furnace, below the admiſſion of this flue into it, to prevent a falſe draught, which would otherwiſe intirely deſtroy its effects on the wind-furnace; and for this end regiſters ſhould be always put to the flues, or chimneys below where the flues enter, of each furnace, whenever two or more vent themſelves into the ſame common funnel.

SUBLIMERS muſt be of glaſs, and may be generally had ready made of a proper figure at the glaſs-houſes, where glaſſes are blown for the common chymical purpoſes. They muſt be inquired for under the name of *bodies*, or cucurbits, which name they bear when applied to medicinal uſes. They ſhould be choſen of a ſpheroidal form; neither the conical ſhape in which ſome, nor the oval in which others are made, being ſo commodious for ſubliming colours as a longiſh ſpheriod; but where they cannot be obtained of this figure, an oval may be diſpenſed with.

The magnitude of the ſublimers muſt be determined by the quantity of matter to be ſublimed, and the dimenſions of the furnace; but thoſe uſed in ſand-pots ſhould be always at leaſt two inches leſs in the diameter than the pot in which they are to be placed; and thoſe uſed in the naked fire ſhould never be more than four inches leſs in diameter than the iron ring of the furnace in which they are to be hung.

Where vermilion is made in great quantities, earthen ſublimers are uſed; but we ſhall ſpeak of them in their proper place.

A PEWTER BOILER is neceſſary for boiling cochineal, brazil, or other woods, French berries, &c. for making lake, brown pink, Pruſſian blue, and many other pigments. It is requiſite that this metal ſhould be uſed for it, becauſe

cauſe iron and copper, as they will neceſſarily be corroded in a greater or leſs degree by the ſaline ſubſtances requiſite to be uſed for making ſeveral ſorts, are extremely injurious to the colours, and ſhould therefore never be ſuffered to approach the finer kinds.

The form of this boiler may be cylindrical, with a bottom making a ſection of a ſphere. Its dimenſions ſhould be three feet in depth, and one diameter: but this may be varied, as the quantities of colours propoſed to be made may vary the occaſion. At the height of about two feet muſt be joined to it a ſtrong margin or rim, by which it may be hung in the furnace; and a little above, muſt be two bow handles oppoſite to each other, by which it may be lifted in and out of the furnace. The whole muſt be wrought ſtrong, as there will be frequent occaſion to move it, when containing a conſiderable quantity of fluid.

The *furnace* for this boiler muſt be conſtructed in the following manner:

A rim of iron, ſuch as was before directed to be uſed for hanging the ſand-pot, together with the other iron-work, muſt be firſt procured. The diameter of the boiler being taken, as alſo its depth below the rim by which it is to hang, the proceeding in the fabrication may be the ſame as that of the furnace for the ſand-pot, till the iron rim is to be fixed; when the courſe of bricks, which is raiſed upon the rim in that kind of furnace, muſt be in this wholly omitted. It is not improper, however, to allow two inches more diſtance in this furnace betwixt the boiler and the fire than was directed for the ſand-pot, becauſe the boiler may otherwiſe be more liable to be melted on any negligent treatment. When the boiler is uſed, it is to be lifted into the furnace, and hung by the rim, which muſt reſt in the groove made for that purpoſe in the iron rim; and if it is to be emptied while the furnace is hot, it ſhould always be lifted up with two or three gallons of fluid remaining in it; otherwiſe the bottom will be melted by the heat of the furnace: and, as the round figure of the bottom renders it not proper for ſtanding of itſelf on the flat ground, a baſs-work haſſock or cuſhion ſhould be made, ſinking in the middle correſpondently to the form of the bottom of the boiler.

A PEWTER BOWL, with a handle of proper length, ſhould be had to the foregoing boiler, for lading out any matter boiled in it; as likewiſe an inſtrument of the ſame metal, made like a poker, but with a flatter end, for ſtirring about any ſolid matter that may be put along with fluids into the boiler.

RETORTS are uſeful for ſome purpoſes in the making colours; and glaſs receivers of various ſizes for many. They may both be of the form in which they are uſually found ready made at the ſhops and glaſs-houſes; but it is proper to have ſome receivers very large, and with necks ſo wide, that the hand may be introduced into them to clean them thoroughly.

A *BALNEUM MARIÆ*, or evaporating bath, is likewiſe neceſſary. It may be made by fitting a tin boiler, formed like the pewter one, to the above deſcribed furnace; but it need only be a foot in depth below the rim for hanging it in the furnace, and only one inch in height above. To this boiler, a pewter veſſel for containing the matter to be evaporated muſt be adapted. It muſt be at leaſt two inches leſs in diameter than the boiler, and muſt have a rim like that of the boiler, by which it may reſt on the edge of the boiler, hanging in its cavity.

Proper FILTERS are extremely requiſite for the preparation of many pigments. They ſhould be made of pewter, in the form of the common earthen cullenders, but with more, and larger holes; and their ſize ſhould be ſuch as admits of their interior ſurface being wholly covered by a ſheet of filtering paper, when laid into them. Their edge ſhould be turned outwards, ſo as to form a margin or rim, by which they may hang on a proper frame over the tubs, or other veſſels, which are to receive the liquid they filter; and this frame may be only two narrow pieces of wood, of ſufficient ſtrength to bear the weight of the filter and its contents fixed together by two other croſs pieces, at ſuch diſtance, that the filter may juſt paſs betwixt the four, and hang by the rim. For theſe filters muſt be provided proper paper; as alſo linen cloths to lay over or under the paper occaſionally. The kind of paper fit for this purpoſe is that called *bloom* or *filtering paper;* but care muſt be taken in the choice *of it;* for it is difficult to find, in common ſtationers ſhops, ſuch as will even moderately well anſwer the end.

For coarſe colours, ſuch as roſe pink, flannel bags may be employed for expedition. They ſhould be made in the form of pudding bags; and are called when applied to the ſame purpoſe in medicine, Hippocrates's ſleeve. They ſhould have proper frames for fixing them, which may be made of three ſticks or wooden rods, fixed together at ſuch a diſtance that the bag being hung upon them by three loops faſtened to it, may have its mouth or opening ſubtend to a due width for pouring in the matter to be filtered.

Long boards muſt be likewiſe provided for drying colours. They ſhould be made of ſound wood, and very well plained; and it will be yet better, if the ſurface be made ſtill ſmoother by varniſhing them with ſeed lac varniſh.

Chalk-ſtones are alſo proper on ſome occaſions, for expidition, for the drying ultramarine, Pruſſian blue, waſhed ochres, and ſeveral other kinds; but they muſt never be uſed for lake, carmine, or any colours made of vegetable matter; for the alkaline quality of chalk may be very detrimental to ſuch colours. Where Pruſſian blue is made in very great quantities, there is a particular apparatus uſed for drying it; but we ſhall ſpeak of that in its proper place.

The levigation of colours, being of the moſt general uſe of any operation, is likewiſe required in many caſes to be moſt perfectly performed; and, therefore, proper inſtruments ſubſervient to it are extremely requiſite. Hand-mills, and ſometimes even horſe-mills, are uſed for groſſer ſorts of pigments, or where very large quantities are to be diſpatched: but, as they are to be had of the proper workmen, duly conſtructed, it is needleſs to deſcribe them here. In the caſe of vermilion, mills of different degrees of fineneſs are requiſite: and that through which it is laſt paſt ſhould be of ſteel, and the moſt cloſely ſet that can poſſibly be wrought. But for this end, inſtructions here are unneceſſary, as dependence muſt be had on thoſe who are the proper makers of ſuch machines; and who will ſucceed beſt in following their own methods. The mullar and ſtone are generally uſeful, and ſhould alone be depended on, at leaſt for completing the levigation after the grinding them in the mills, whenever the colours are of any great value or nice uſe. Baſons ſhould likewiſe be provided for waſhing over the colours according to the manner below deſcribed.

SECT. III.

Of the general operations ſubſervient to the making or preparing colours.

THE operations ſubſervient to the making and preparing colours, are *ſublimation*,—*calcination*,—*ſolution*,—*precipitation*,—*filtration*,—and *levigation*.

As the practice of moſt of theſe operations is confined at preſent, in a great degree, to the purpoſes of chymiſtry, and therefore very little underſtood by any, except thoſe who concern themſelves in that art, I ſhall endeavour to explain them, as far as they relate to the preparation and treatment of colours. I ſhall alſo give ſuch general directions for the performing them as may take away the neceſſity of repeating, on every occaſion, thoſe particulars which occur in almoſt all the proceſſes that partake of the ſame nature; but with reſpect to ſuch operations as are more commonly known and practiſed, I ſhall only touch on them in a more general way, without entering into minuter conſiderations regarding them.

Of ſublimation.

SUBLIMATION *is the raiſing ſolid bodies in fumes, by means of heat; which fumes are afterwards collected by condenſation, either in the*

the upper part of the ſame veſſel where they are raiſed, or in others properly adapted to it for that purpoſe.

The end of ſublimation is, either to ſeparate ſubſtances from each other, in order to the purification of one of them, or to mix them more perfectly than can be effected without ſubjecting them to ſuch a degree of heat as will neceſſarily render them volatile.

The means are, to put the matter, whether ſimple or compound, into a proper veſſel or ſublimer, and there give it a due heat, by placing it in a ſand-pot, or the cavity of ſome furnace where the naked fire is required; in doing which the following particulars are the moſt material objects of attention.

The firſt care muſt be to provide glaſſes of the kind above-mentioned, page 25, and of a due ſize, which muſt be regulated, as was before mentioned, by the quantity of matter to be ſublimed, and by the dimenſions of the ſand-pot, or cavity of the furnace where they are to be uſed.

The ſublimer uſed for making King's yellow, or for any other operation to be performed in a ſand-pot, need no previous preparation. But thoſe to be uſed for vermilion, which muſt be placed in the naked fire, ſhould be firſt well coated with the fire-lute; and a rim of the ſame matter muſt be worked round the coat at about two-thirds of the height of the ſublimer, to ſupport it in the iron ring when let down into the cavity of the furnace This coat of lute ſhould be laid on of ſuch thickneſs that it may be about half an inch thick when thoroughly dry, and if it be laid on at ſeveral diſtances of time, ſo that the firſt covering of the glaſs may be pretty dry before the ſecond be put on, it will be the better; but great care ſhould be taken that the whole be of ſufficient dryneſs before the ſublimer be let down into the furnace, and that the rim of lute fit well the iron rim; for otherwiſe ill ſucceſs will moſt likely attend the proceſs of the operation. In default of the fire-lute, the following may be ſubſtituted in its place for the coating ſublimers, and is indeed, on account of its cheapneſs, moſt commonly uſed, though greatly inferior to the other with reſpect to the ſecurity of the glaſſes.

"Take of Windſor loam, or very good com-
"mon loam, fine ſand, and dung of horſes
"which feed on hay, each equal parts; tem-
"per them with water, or the blood of any
"beaſt, and beat them well together."

To fix the ſublimers in the ſand-pots, an inch and half, or two inches of ſand muſt be firſt put into the pot, on which the ſublimer muſt be gently ſet; the pot muſt then be filled with ſand up to the brim, and the matter to be ſublimed muſt be put into the ſublimer through its neck or mouth, which muſt be afterwards covered by a piece of tile, or flat glaſs, laid looſely upon it.

The ſublimers uſed without a ſand-pot muſt be fixed in the cavity of the furnace, by letting them through the ring of iron on the top of the furnace, till they hang by the rim of lute. After which the joint, formed by the rim and ring, muſt be made good by pointing with the fire-lute; which muſt, however, be of a dryiſh conſiſtence, and uſed ſparingly, leſt it moiſten the lute of which the rim is made, and cauſing it to give way, occaſion the ſublimers' ſlipping through into the furnace.

The ſublimers being fixed, the fire muſt be lighted, but muſt be kept in a moderate degree till the lute be thoroughly baked; when, being increaſed, the matter will riſe in fumes, and form itſelf in a cake on the upper part of the glaſs. This may be urged forwards by raiſing the fire as ſtrongly as it will bear to be without forcing the fumes out of the mouth of the ſublimer; which, if it appear to happen, muſt be remedied as quickly as poſſible by abating the heat. But proper care muſt be taken that the mouth of the glaſs or ſublimer be not choaked up by the ſubliming matter; for which reaſon, the tile, or piece of glaſs which covers it, ſhould be lifted up at proper intervals, and an opening made, with the end of a tobacco-pipe, into the cavity of the ſublimer. On the neglect of this caution, the glaſſes are very liable to be burſt by the rarefaction of the fumes, on the fire's burning briſkly. When no more fumes ariſe, which may be known by the abatement of the heat in the upper part of the ſublimer, notwithſtanding the fire be equally ſtrong, the operation

tion may be concluded to be completed, and the furnace being ſuffered to cool, the ſublimer muſt be taken out and broken, and the cake of ſublimed matter in the upper part of the glaſs collected, obſerving carefully that it be kept free from the droſs or *caput mortuum* left in the bottom.

Of calcination.

CALCINATION *is the operating on ſubſtances, by means of heat, ſo as to produce ſome change either in their texture or colour.*

Calcination is ſometimes performed by expoſing ſubſtances to the fire with as great extent of ſurface as poſſible; as in the caſe of lead for converting it into the red lead or *minium*, and antimony to prepare it for its converſion into glaſs. In other caſes it is performed by putting the ſubſtances into a crucible, or other ſuch veſſel, in a more collected body, and ſurrounding the veſſel with fire; and there is a caſe indeed, viz. that of the maſticot, where bringing it near the fire will be ſufficient.

The red lead, red ochre, and antimony for making the glaſs, being calcined in large quantities by thoſe who make it their ſole buſineſs, and have large furnaces like ovens conſtructed for theſe particular purpoſes, I ſhall be leſs explicit with regard to them; as it will be ſcarcely worth while for any, but thoſe who carry it on as a groſs manufacture, to concern themſelves with them, unleſs as a ſpeculative experiment.

The calcination of other ſubſtances for the preparation of colours may be performed by putting the matter into a crucible, and placing it in a common fire; or, where greater heat or room is required, in the wind-furnace deſcribed, p. 23, where the fire muſt be raiſed round it, and continued of ſuch a degree, and for ſuch a duration as the occaſion may make neceſſary.

This may be underſtood to be all that is requiſite where calcination is ordered in the proceſſes below given, without any particular direction for the manner of performing it; but where ſuch direction is needful, it will be found to be inſerted as each occaſion occurs.

Of ſolution.

By SOLUTION *is meant the reducing any ſolid body to a liquid ſtate by means of another, into which, being put, it is melted or converted itſelf alſo into a ſtate of fluidity.*

This is performed by the ſimply putting one body to the other and mixing them well together, except in ſome caſes where heat is neceſſary to expedite the effect.

When therefore bodies are ordered in the proceſſes below given to be diſſolved in others, it is only to be underſtood that they are to be put together, and ſtirred or ſhaken at proper intervals, till the ſolid body be melted. But where that appears to proceed too ſlowly, the veſſel muſt be put into a proper heat to accelerate the operation, though this heat ſhould be always underſtood to be leſs than will make water boil, except where the contrary be expreſsly directed.

Of precipitation.

PRECIPITATION *is the re-ſeparating a ſolid body from any fluid one, in which it is diſſolved or melted, by the addition of a third body, which is capable of producing that effect.* As for example, if ſeed-lac be diſſolved in ſpirit of wine, and water be added, the ſeed-lac will be precipitated, that is, ſeparated from the ſpirit in which it was diſſolved, and reduced to the ſtate of an impalpable powder, which will ſubſide to the bottom of the veſſel containing the mixture.

The means of precipitation are therefore equally ſimple with thoſe of ſolution, there being nothing more required, than to put the matter, which is to ſuffer the precipitation, into a proper veſſel, and to add that which is to cauſe it; and when the effect is produced, to ſeparate the fluid from the ſolid body precipitated, by pouring off what can be ſo parted from it, and draining off the reſt in a filter.

Of filtration.

FILTRATION, though a very ſimple operation, yet when it is required to be done through paper, and great quantities of fluid are to be filtered, demands ſome nicety and judgment in the management of it; otherwiſe accidents are very liable to happen, which retard greatly the work, and occaſion frequently much delay and trouble, eſpecially with thoſe who are unpractiſed in it.

The end of filteration is of two kinds; the one to free fluids from any ſolid bodies of a feculent nature with which they are mixed; the other, to ſeparate any precipitated powder, or other ſolid body, from ſuperfluous fluid. The means muſt be varied accordingly. In the firſt caſe, paper, if it be of a right kind, is ſufficient; in the other caſe, a coarſe linen cloth muſt be put over the paper; otherwiſe, in taking the filtered matter out of it, parts of the paper will unavoidably mix themſelves with it, and irremediably foul it.

Where filtering through paper is neceſſary, the pewter cullenders, deſcribed p. 28, will be found extremely commodious. But great care muſt be taken to accommodate rightly the paper to the cullender, as well as to pour the matter very ſlowly into it at firſt, till it be well ſettled; for on neglect of this caution the paper will be very apt to burſt, and delay the operation, by fouling the veſſels with the unfiltered matter. If, as frequently happens, the paper which is procured prove of a bad texture, and want tenacity to bear the weight of the fluid poured into it; or when the fluid itſelf may be of a very relaxing nature, and weaken the paper, a coarſe linen cloth ſhould be always uſed with the paper, whatever the intention of the filtering may be. For, though the fluid will paſs faſter through paper alone, yet much time will be ſaved from adding the linen, by preventing the troubleſome accidents that will elſe unavoidably occur.

In filtering large quantities it will be frequently found, that, after the paper has been for ſome time ſoaked in the wet, the operation will proceed very ſlowly: the ſwelling of the ſubſtance of the paper, as well as the foulneſs of the fluid, diminiſhing, and at laſt choaking up the percolating pores of the paper. When this is the caſe, the paper ſhould be always changed as ſoon as it is perceived that the filter ceaſes to run moderately; for, otherwiſe, the operation becomes intolerably tedious.

Where great quantities of more ordinary colours are made, ſuch as roſe pink, the kind of Pruſſian blue uſed for paper-hangings, or other ſuch groſſer kinds, the flannel bags mentioned, p. 29, may be uſed; as the filtering ſuch great quantities of fluid through paper would be almoſt an endleſs labour. In doing this, nothing more is required than to hang the bags on the frames by their loops, and to feed them with the matter to be filtered; only the firſt quantity which runs through, being apt to be foul, muſt be returned into the bag, till it be perceived that the fluid come clear.

Of evaporation.

EVAPORATION, or *the reducing moiſt bodies to dryneſs by an artificial heat*, where it is not required to be in *balneo mariæ*, may be performed by boiling in any commodious veſſel, till the matter be freed from all humidity; the veſſel being fed with a freſh ſupply as the fluid appears to be diminiſhed. But in the caſe of vegetable or animal ſubſtances, where they are to be evaporated to dryneſs, or to a thick conſiſtence, as in the artificial gall-ſtones, lake, or brown pink, it ought to be performed in *balneo mariæ*. This is done by putting the veſſel containing the matter into another filled with water, and kept of a boiling heat; for, by this means the ſubſtances are prevented from burning to the veſſel as they grow dry, which would otherwiſe unavoidably happen.

The evaporation in *balneo mariæ* may be commodiouſly performed in the veſſels I have deſcribed, p. 28, by fixing the tin boiler in the furnace, and hanging the pewter veſſel in it by the rim; the remaining cavity of the tin boiler being filled with water, and made to boil till the matter be brought to a proper dryneſs or conſiſtence. This is all that is requiſite where the quantity of matter remaining after the evaporation is large; but, where it is ſmall, it is better to uſe ſome ſmaller veſſel; as it would be ſo diffuſed on the ſides and bottom of the pewter one as would render it difficult to be collected. The beſt expedient for this is to uſe a China baſon of a proper ſize, and to hang it by packthread to two ſticks laid a-croſs the edge of the boiler, and fixed at a proper diſtance from each other, by two other ſticks tied to them croſs-way; by which little machine the baſon may be ſuſpended in the boiling water; and being fed with the fluid to be evaporated, as proper room appears in it for a freſh ſupply, will perform the office extremely well. But where the quantity of fluid to be evaporated is great, though the remaining matter when dry be ſmall, a previous evaporation by the naked fire may be uſed till the quantity be properly reduced; taking care that the matter do not acquire ſo thick a conſiſtence as may ſubject it to burn to the ſides or bottom of the boiler.

Of levigation and waſhing over.

LEVIGATION of colours, where great quantities are in queſtion, is performed in hand and horſe-mills; but this fails to produce ſo perfect an effect as the mullar and ſtone which is uſed in all other caſes; the aſſiſtance of a peſtle and mortar being indeed taken in the caſe of glaſs and hard bodies to prepare them for the mills or ſtone.

The method of uſing theſe ſeveral kinds of inſtruments, as well as the conſtructure of the inſtruments themſelves, are ſo well known that is needleſs to dwell on any particulars regarding them. But the other method ſubſervient to the intention of levigation (that is to ſay, to the reducing pigments to a due degree of fineneſs as powders) called *waſhing over*, being leſs generally underſtood, and yet of the greateſt utility for procuring many colours in the moſt perfect ſtate, I will explain fully the manner of performing it, which is as follows:

"The matter intended to be brought by " this operation to an impalpable fineneſs, " muſt be firſt well levigated, or if it be a " body of a chalky texture, as the ochres bro- " ken to a groſs powder by pounding, then " let it be put into a deep baſon almoſt full " of very clean water, and there well ſtirred " about. Having reſted a ſhort time, that " the groſſer parts may ſink to the bottom, let " the water, together with the finer parts yet " ſuſpended in it, be poured off into another " baſon of the ſame kind, and ſuffered to ſtand " at reſt till the powder has totally ſubſided " and left the water clear. Let as much of " this water as can without diſturbing the " ſediment be then poured back into the firſt " baſon, and let the ſtirring, decantation, &c. " be repeated as before, as often as ſhall be " found neceſſary to ſeparate all the powder " that is of ſufficient fineneſs. The remaining " groſſer part may be then again ground, and " the ſame treatment continued till the whole " of the matter be obtained in that ſtate. This " operation is, however, in ſome caſes to be "repeated ſeveral times before the colour can "be rendered ſo perfectly fine as may be "wiſhed; but when it is duly executed, pigments may be reduced to the moſt impalpable powders with great eaſe, even though, "like vermilion, they be of the moſt obdurate "texture, and the ochres, or any ſuch bodies "of a chalky or clayey texture as grow ſoft "in water, may be freed from ſand, ſtones, or "other impurities, and rendered of the higheſt "degree of fineneſs, even without any previous grinding. Where great quantities of "matter are to be waſhed over, as in the caſe "of ochres, common Indian red, &c. tubs muſt "be had to ſupply the place of baſons, and "lading with a bowl-diſh muſt be uſed inſtead of decantation or pouring off."

SECT. IV.

Of the nature and preparations of particular colours.

CLASS I. Of red colours.

Of vermilion.

VERMILION is a bright ſcarlet pigment, formed of common ſulphur and quickſilver, previouſly prepared by a chymical proceſs into a ſubſtance, called *factitious cinnabar.*

cinnabar. It is one of the moſt uſeful colours in every kind of painting, except enamel or on glaſs; as it is of moderate price, ſpends to great advantage in any kind of work, and ſtands or holds its colour extremely well. It may be prepared in great perfection by the following proceſs:

" Take of quickſilver eighteen pounds, of " flowers of ſulphur ſix pounds: melt the ſul- " phur in an earthen pot, and pour in the " quickſilver gradually, being alſo gently " warmed, and ſtir them well together with " the ſmall end of a tobacco-pipe. But if " from the efferveſcence, on adding the lat- " ter quantities of the quickſilver, they take " fire, extinguiſh it by throwing a wet cloth " (which ſhould be had ready) over the veſ- " ſel. When the maſs is cold, powder it, ſo " that the ſeveral parts may be well mixed to- " gether. But it is not neceſſary to reduce it, " by nicer levigation, to an impalpable ſtate. " Having then prepared an oblong glaſs body, " or ſublimer, by coating it well with fire-lute " over the whole ſurface of the glaſs, and work- " ing a proper rim of the ſame round it, by " which it may be hung in the furnace in ſuch " a manner that one half of it may be expoſed " to the fire, fix it in a proper furnace; and " let the powdered maſs be put into it, ſo as " to nearly fill the part that is within the fur- " nace, a piece of broken tile being laid over " the mouth of the glaſs. Sublime then the " contents with as ſtrong a heat as may be

" uſed without blowing the fumes of the ver-
" milion out of the mouth of the ſublimer.
" When the ſublimation is over, which may
" be perceived by the abatement of the heat
" towards the top of the body, diſcontinue
" the fire; and, after the body is cold, take
" it out of the furnace and break it; collect
" then together all the parts of the ſublimed
" cake, ſeparating carefully from them any
" droſs that may have been left at the bottom
" of the body, as alſo any lighter ſubſtance
" that may have formed in the neck, and ap-
" pears to be diſſimilar to the reſt. Levigate
" the more perfect part; and, when reduced
" to a fine powder, it will be vermilion pro-
" per for uſe; but on the perfectneſs of the
" levigation depends, in a great degree, the
" brightneſs and goodneſs of the vermilion.
" In order therefore to perform this, it is ne-
" ceſſary that two or three mills of different
" cloſeneſs ſhould be employed, and the laſt
" ſhould be of ſteel, and ſet as finely as poſſible
" according to what has been before men-
" tioned in ſpeaking of the apparatus for
" making vermilion, Section II."

Where great quantities of vermilion are manufactured, it is a practice, for the ſake of cheapneſs, and to ſave the labour of coating, with ſo much care, glaſs ſublimers with lute, to have earthen ones made of the ſame ſort of clay as that employed for long necks. When this is done, theſe ſublimers ſhould be of a ſpheroidal figure, and about an inch leſs in their leaſt diameter than the ring of the furnace in which they are to be hung; they muſt alſo have a rim worked at about two-thirds of this height, of the ſame matter they are made of, by which they may hang in the iron ring, as the glaſs ſublimers, by means of the rim of lute. It is much the beſt way, however, to give them a coat of good common loam, ſand, and horſe dung. Indeed, except for the ſake of curioſity, or where none that is genuine and good can be otherwiſe procured, it is never worth while to go through the proceſs for making vermilion where great quantities are not to be prepared; for it is both troubleſome, expenſive, and very precarious with regard to the ſucceſs of the operation to make ſmall quantities.

The perfection of vermilion is to be of a very bright colour, and of a great degree of fineneſs, and that is moſt eſteemed which moſt inclines to a crimſon hue. Theſe appearances, beſides the rendering it more advantageous for the purpoſes to which it is employed in painting, are the readieſt proofs of its being unſophiſticate.

Vermilion, when pure, will ſtand very well, whatever vehicle it be uſed with, and may therefore be depended upon for carnations, or the niceſt purpoſes.

It is very uſual, I might almoſt ſay general, for dealers to ſophiſticate vermilion with red lead, which renders it very liable to change, and loſe its brightneſs, as the red lead is apt to turn black, whether uſed with oil or water. This adulteration, when made in a greater degree, may be perceived by the difference in colour betwixt the ſophiſticated and pure. For the red lead being conſiderably more of the orange hue than the vermilion, renders it leſs crimſon: but to detect with certainty the fraud of mixing red lead with the vermilion, both with reſpect to the general fact and the proportion, the following means may be uſed.

" Take a ſmall, but known quantity of the
" vermilion ſuſpected to be adulterated, and
" put it into a crucible, having firſt mixed
" with it about the ſame quantity, in bulk, of
" charcoal duſt; put the crucible into a com-
" mon fire, having firſt covered it with a leſſer
" crucible inverted into it, and give a heat
" ſufficient to fuſe lead; when the crucible,
" being taken out of the fire, ſhould be well
" ſhaken, by ſtriking it againſt the ground.
" If the ſuſpected adulteration has been prac-
" tiſed, the lead will be found reduced to its
" metalline ſtate in the bottom of the crucible,
" and being weighed and compared with the
" quantity of cinnabar that was put into the
" crucible, the proportion of the adulteration
" may be thence certainly known; but if no
" lead be found in the crucible, it may be
" ſafely inferred that no red lead had been
" commixt with the vermilion."

It is very neceſſary that vermilion ſhould be extremely well levigated, as it both contributes to its brightneſs and ſpending further in the work; and this can ſcarcely be effectuated by mills without the ſubſequent uſe of the mullar and ſtone, though it has been uſual for preparers to paſs it off as it comes out of the mill; but whoever would have vermilion in perfection, eſpecially for painting carnations or mixing with white, ſhould improve its fineneſs by waſhing over.

Of native cinnabar.

NATIVE CINNABAR is a pigment compounded of quickſilver and ſulphur; and therefore differs in nothing from vermilion but in the manner of its production, and the being ſometimes of a more crimſon colour. Some perſons of intelligence have, however, doubted whether there be any native cinnabar ſufficiently bright and clear for the uſes of painting, and conſequently whether all that is brought hither from the Eaſt, or ſaid to be ſo, be not factitious; there being none found in the European mines which can give reaſon to think otherwiſe. Native cinnabar is found naturally formed in the earth, though ſeldom, ſetting aſide the doubt here mentioned, ſo pure as to be fit for the uſes of painting, at leaſt without being purified by ſublimation; which operation, being probably not well known to thoſe who have any concern in the finding it, has not been hitherto practiſed, as far as appears. On this account native cinnabar has as yet been ſcarce and dear; a great part of what has been ſold as ſuch, having certainly been factitious; but the crimſon colour of ſome quantities and the miſtaken notion that it would ſtand better than vermilion, becauſe it was a natural production, have made it to be coveted by painters who are curious in colours. It is, however, never worth their while to be ſolicitous about it, as it never excels the beſt vermilion in brightneſs, and as that may be likewiſe rendered equally crimſon, if the proportion of ſulphur be made only as one to ſix or ſeven of the quickſilver. Moreover, if there really were any ſuperiority, with regard to ſtanding of the native cinnabar to the other, there never could be any certainty of having it genuine.

When native cinnabar is uſed as a colour, there is no other preparation neceſſary than a careful levigation, which may be beſt performed with water on the ſtone; but whoever would have it in the moſt perfect ſtate, muſt ſuperadd waſhing over to the grinding. It has been uſual to waſh this colour, as well as vermilion, in urine, juice of lemon, and other fluid ſubſtances; but there is not the leaſt alteration to be made in it by any ſuch means, if it be pure, for the reaſon before given with reſpect to vermilion.

Of red lead, or minium.

RED LEAD is lead calcined, till it acquire a proper degree of colour, by expoſing it with a large ſurface to the fire.

The bright orange colour of red lead might render it valuable in painting, if it would ſtand with certainty in either oil or water; but it is ſo ſubject to turn black when uſed with oil, and even ſometimes when with water, that it is by no means fit to be truſted either alone or mixed with any other colours where the ſtanding well is of conſequence; except in hard varniſhes, indeed, which, locking up the pigments from the air and moiſture, renders their colour durable in almoſt all inſtances. For this reaſon red lead is ſeldom now employed in oil, nor very frequently in water, but for very groſs purpoſes, or to make a ground for vermilion, which being ſlightly ſpread upon it, will go much farther than on any other ground. But even this is not adviſable where it is deſired the colour ſhould ſtand for a long time.

The goodneſs of red lead may be diſtinguiſhed by the brightneſs of its colour; for whatever it is adulterated with, will of courſe diminiſh it; and it is on this account not ſo liable to be ſophiſticated as white lead, vermilion, and ſome other pigments. The adulteration, however, where any is ſuſpected, may be eaſily detected by the following means.

" Put an ounce of what is ſuſpected into a
" crucible, with an equal bulk of charcoal
" duſt, mixing them well together. Place
" the crucible in a common fire ſufficiently
" hot to melt lead, covering it with another
" ſmaller crucible inverted into it. Continue
" it

" it in the fire for ſome time, and then take
" it out, and ſtrike it againſt the ground.
" The red lead will then be reduced to its metallic
" ſtate, and being poured out and freed
" from the charcoal duſt, may be weighed
" when cold, and will ſhew by its deficience
" the proportion of adulterating matter."

Of ſcarlet ochre.

SCARLET OCHRE is the ochrous earth, or rather iron, which is the baſis of green vitriol, ſeparated from the acid of the vitriol by calcination. It is of a broken orange ſcarlet colour; but for its great certainty of ſtanding, in which it equals any of the native ochres, and its extreme great ſtrength and warmth either as a ground or in the ſhades of carnations, it is nevertheleſs very valuable. It may be uſed as a colour in any kind of painting (but in enamel it turns to a tranſparent yellow like brown pink, if the flux be ſtrong) and is eaſily prepared in the following manner:

" Take of green vitriol or copperas any
" quantity, and being put into a crucible, of
" which it will fill two thirds; ſet it on a
" common fire to boil (taking care that it do
" not boil over) till the matter be nearly
" dry, when it will be greatly diminiſhed
" in quantity. Fill then the crucible to the
" ſame height again, and repeat the boiling
" and repleniſhing, till the crucible be filled

"with dry matter. Take it then from this "fire and put it into the wind-furnace; or, if "the quantity be ſmall, it may be continued "in the ſame fire, the coals being heaped up "round it. Let the contents be calcined "there till they become of a red colour when "cold, which muſt be examined by taking "a little of the matter out of the middle, and "ſuffering it to cool; for ſo long as it re- "mains hot the red colour will not appear, "though it be ſufficiently calcined. When "duly calcined, take the ochre out of the cru- "cible while hot, and put it into water, in "which the parts of the broken crucible may "be ſoaked likewiſe, to obtain more eaſily "what ſhall adhere to them, and ſtir the "ochre well about in the water, that all the "remaining vitriol may be melted out of it. "Let it then ſettle, and when the water ap- "pears clear, pour it off and add a freſh "quantity, taking out all the broken pieces "of the crucible, and proceed as before, "repeating ſeveral times this treatment with "freſh quantities of water. Then purify the "ochre from any remaining foulneſs by waſh- "ing over; and, having brought it to a proper "ſtate of dryneſs, by draining off the fluid "by a filter, in which the paper muſt be "covered with a linen cloth, lay it to dry on "boards."

Common Indian red.

The COMMON INDIAN RED meant here is of an hue verging to the ſcarlet; but the true Indian red (of which I ſhall ſpeak below) is greatly inclining to the purple, among which colours it may be well claſſed.

This common kind has been introduced as a counterfeit or ſubſtitute for the real kind brought from the Eaſt-Indies; and has, by its cheapneſs and ſerving equally well for common purpoſes, prevented that from being brought over for a long time. So that the true teint of the original kind, being in ſome meaſure forgotten, this has been gradually made to vary from it, till it is in fact a quite different colour. But though the common Indian red will not anſwer the ends of the true kind, it is yet a very uſeful colour for many other purpoſes; and is therefore, on account of its ſtanding, and warm, though not bright colour, much uſed as well in finer as coarſer paintings in oil. As it is made of the *caput mortuum* of vitriol after the diſtillation of *aqua fortis* and oil of vitriol, it is afforded at a very moderate price, and may be thus managed.

" Take of the *caput mortuum*, or ochre left
" in the iron pots after the diſtillation of *aqua*
" *fortis* from nitre and vitriol, two parts, and of
" the *caput mortuum* or *colcothar* left in the long
" necks after the diſtillation of oil of vitriol,
" one part; break the lumps found among

" them, and put them into tubs with a good " quantity of water, and having let them " ſtand for a day or two, frequently ſtirring " them well about, lade off as much water as " can be got clear from them, and add a freſh " quantity, repeating the ſame treatment till " all the ſalts be waſhed out, and the water " come off nearly inſipid. The red powder " which remains muſt then be waſhed over, " and, being freed from the water, laid out to " dry.

" When this is deſigned for nicer purpoſes, " it ſhould be waſhed over again in baſons; " the groſs manner of lading it out of one " tub into another not fitting it always com" pletely to ſuch ends."

As it is now difficult to procure the *caput mortuum* left after the diſtillation of oil of vitriol from green vitriol, the oil of vitriol being now for the moſt part made from ſulphur, the reſiduum of the diſtillation of *aqua fortis* when made with green vitriol may be uſed alone; but in this caſe the matter ſhould be firſt calcined in the wind-furnace, p. 23, to give it a more purpliſh hue.

Of Venetian red.

VENETIAN RED is a native red ochre, rather inclining to the ſcarlet than the crimſon hue: it is not far different from the common Indian red, but fouler, and may therefore be eaſily prepared from mixing common red ochre with the colcothar or *caput mortuum* taken out of the *aqua fortis* pots, and waſhed over.

As it is generally uſed by houſe-painters in imitation of mahogany, it requires no other preparation than to be well ground with the oil with which it is uſed; but when, as is ſometimes the caſe, it is uſed in miniature painting, it ſhould be carefully waſhed over.

Spaniſh brown.

Spaniſh brown, or brown red, is a native earth found in the ſtate, and of the colour in which it is uſed; it is nearly of the ſame colour with the Venetian red, but fouler. It was probably from its name brought originally from abroad, and was then moſt likely of a finer kind; but what is now uſed is the produce of our own country, being dug up in ſeveral parts of England.

It is uſed for grounds and primings for coarſe work by houſe-painters, and by colourmen in the preparation of the cloths for pictures and other coarſe work, but ſeldom in any more delicate paintings. It therefore needs no other preparation than freeing it well from ſtones and filth.

Though if any, who may be deſirous to uſe it for nicer purpoſes, want to have it in a more perfect ſtate, they may make it equal in fineneſs and purity to any other pigments whatever, by waſhing over. And if they can render it uſeful to them with regard to the colour, they may depend on its ſtanding equally with any other pigment whatever, being a native ochrous earth, of which kind none are ever known to fail, whether they be uſed of their natural teint, or changed by calcination.

Of calcined, or burnt terra di Sienna.

The *TERRA DI SIENNA* is a native ochre brought hither from Italy in a ſtate in which it is naturally found. It is yellow originally, (of its qualities in which ſtate we ſhall treat in its proper place below) but when moderately calcined it becomes an orange red, though not very bright. Being, however, ſemi-tranſparent in oil, it is of great uſe where a ſtrong brown red ſhade is wanted, as in the face in portrait painting, and on many other occaſions.

The calcination may be performed by puting lumps of it, either in a crucible, or naked in a common fire, and continuing it there till the colour be changed from yellow to red in the proportion wanted; after which it muſt be well levigated and waſhed over.

It is ſcarcely ever uſed but in oil painting, having no advantage for other purpoſes over pigments much more eaſily obtained.

Terra di Sienna admits of no adulteration, if it be had in the ſtate in which it is naturally found, which is that of hard lumps. It may be diſtinguiſhed from other ochrous earths by its ſemi-tranſparency.

With reſpect to the goodneſs of *terra di Sienna*, we have but one kind brought here, all difference therefore of one parcel from another muſt lie in their being more or leſs pure.

Of carmine.

CARMINE is a bright crimſon colour, and is formed of the tinging ſubſtance of cochineal brightened with *aqua fortis*, by a proceſs ſimilar to that uſed for dying ſcarlet in grain. It is of great advantage in painting as well in water as varniſh, both on account of its beauty and ſtanding well; but it will not mix with oil ſo as to have the due effect in that kind of painting.

The preparation of this colour in perfection is kept a ſecret by thoſe who prepare it. The greateſt part of what is uſed here is brought from France; what is made in England not ſtanding well in general, but being apt to turn purple on the addition of any kind of white, or even with the ſweat of the hands or face. Mr. Godfrey, the chymiſt, is nevertheleſs poſſeſſed of a method of preparing it entirely free from this defect; and I have ſeen ſome parcels made by him which were equal to the beſt French I ever ſaw. The ſuperiority of the French carmine, as well as of the ſcarlet dye, has been attributed to ſome qualities in the air and water of France; but nothing is more abſurd than this ſuppoſition, as the air has very little concern in the production of carmine; and the qualities of the water, if different, might be artificially changed. But the difference itſelf betwixt the Engliſh and French carmine, which does not lie in the beauty of the colour, but in its durableneſs and fixt nature, clearly evinced a diverſity in the preparation; and Mr. Godfrey's ſucceſs leaves no room to doubt but that the carmine may be equally well made in this country, when we are thoroughly maſters of the art. The extenſion of this art would be a conſiderable ſaving to the public, as at preſent we buy of France the far greateſt part of what is conſumed; which is more than can be eaſily imagined, till we recollect how frequent the uſe of red is grown among the Engliſh ladies; and that this is almoſt the only ſubſtance uſed in this country as a red paint for living faces.

The compilers of the new French Cyclopedia have given two or three old recipes for the preparation of this colour; and afterwards recommended another, as preferable to them, taken from Kunckel; which, on examination, is only a proceſs for making bad lake of ſcarlet rags. But rather than to inſert ſuch imperfect inſtructions for the making an article of great conſequence, as may delude thoſe who are earneſt in their purſuit of this art into a fruitleſs expence of time and money, or to reveal ſome information which I owe to the confidence of a friend, to his diſadvantage, I chooſe to be ſilent on this particular, till I can obtain a ſatisfactory recipe by means which leave me at liberty to publiſh it without breach of honour.

Of lake.

LAKE is a white earthy body, as cuttle-fiſh-bone, the baſis of alum or chalk, tinged with ſome crimſon vegetable dye, ſuch as is obtained from cochineal or Braſil wood diſſolved or taken up by means of ſome alkaline ſalt, and precipitated on the earth by the addition of ſome acid.

Lake is uſed in all kinds of painting (except enamel) but particularly in oil, where it ſupplies the place of carmine, which does not at all agree with that vehicle. It is valuable both for its brightneſs and crimſon teint, which makes it uſeful for carnations to the portrait painters; for ſkies to the landſcape, or ſhip painters; and for flowers to thoſe who paint ſtill life. Its tranſparency in oil renders it alſo of great ſervice in glazing, as it is called, over vermilion; and in painting ſcarlet draperies, and the red parts of the lips; and its acquiring a dark hue by this tranſparency, when uſed without the addition of any opake pigment, gives it an unrivalled excellence in the ſhades of red draperies or other ſimilar caſes. Notwithſtanding theſe meritorious qualities, lake is not at preſent univerſally approved; nor without reaſon; for there is a defect which makes it to be frequently rejected where its uſe can be avoided. This defect is the uncertainty of its ſtanding, when prepared in that manner which moſt conduces to its perfection in other reſpects. For though ſome parcels will hold their colour entirely well, yet others prepared in the ſame manner, as far as art can aſſure it, will fly in a degree that makes the uſe of it deſtructive to any painting; and if this defect be effectually remedied, as it may be by ſecuring the tinging particles by gums from all attacks of the air, yet that is generally at the expence of the brightneſs and tranſparency; the earth, which is the baſis of the pigment, being locked up by the gums, and rendered incapable of being combined intimately with, or imbibing the oil. Beſides the perfections of lake, which it may have in common with other colours, there is yet another that relates only to itſelf. This is the inclining to the ſcarlet hue, which makes it more valuable for almoſt all the purpoſes which it is applied to, and where this quality joined to the others happens to be found in it, there is ſcarcely any limits to be ſet to its value with eminent painters of any kind, as was ſhewn in the inſtance of a parcel made by an unknown perſon, ſuppoſed to be a member of the Royal Society, and vended by one Stocks, then a colourman in Newgate-ſtreet, which was afterwards ſold by ſome of thoſe who purchaſed it of him at two guineas an ounce.

Lake was moſt probably made from the colour found in the grains of the ſtick-lac, from whence it ſeems to have taken its name.

But it may be made from a great variety of ſubſtances which afford a crimſon tinge, though at preſent it is ſeldom prepared from any other than cochineal, ſcarlet rags, and Braſil wood.

The beſt of what is commonly ſold is made from the colour extracted from ſcarlet rags, and depoſited on the cuttle-bone, which may be done in the following manner.

" Take a pound of the beſt pearl-aſhes, " and, having diſſolved them in two quarts " of water, purify them by filtering through " paper; add then to this ſolution two more " quarts of water, and having put in a pound " of ſcarlet ſhreds procured of the tailors, " (for they muſt be entirely clean) boil them " in the pewter boiler, deſcribed p. 25, till the " ſhreds appear to have wholly loſt their ſcar- " let colour. Take them out of the ſolution " and preſs them well, dipping them after in " water and preſſing them again, that all the " fluid they have imbibed may be got from " them, in order to be put back to the reſt. " Take then another pound of the ſcarlet " ſhreds, and repeat the like treatment of them " in the ſame ſolution, as alſo a third and " fourth pound. While this is doing, diſſolve a " pound and half of cuttle-fiſh-bone in a pound " of ſtrong *aqua fortis* in a glaſs receiver; add- " ing more of the bone, if it appear to pro- " duce any ebullition in the *aqua fortis*, and " having ſtrained off this ſolution through flan- " nel, pour it into the other by degrees, ob- " ſerving whether it produce any effervefcence “on putting in the laſt quantity; which if it do in any great degree, more of the cuttle-fiſh-bone muſt be diſſolved in *aqua fortis*, and the ſolution very gradually added till no ebullition appear to be raiſed by it in the mixture. If this be properly managed, the fluid will ſoon become clear and colourleſs, and the tinging particles extracted from the ſhreds, together with the cuttle-fiſh-bone, will ſubſide to the bottom and form a crimſon ſediment, which is the lake. The water muſt then be poured off; and two gallons of hard ſpring water muſt be put to the lake, and well ſtirred about to mix them. This being likewiſe poured off, after the lake is again ſettled to the bottom, muſt be replaced by another two gallons; and the ſame method muſt be repeated four or five times; but if hard water cannot be procured, or the lake appear too purple, half an ounce of alum ſhould be added to each quantity of water before it be uſed. When the lake is thus ſufficiently freed from the ſalts, it muſt have the water drained from it in a filter covered with a linen cloth, which has been ſo worn as to have no knap or down remaining on its ſurface. After the lake has been drained to a proper dryneſs, it muſt be dropped on clean boards, by means of a proper funnel, through which the drops being ſuffered to paſs, and reſt on the board at proper diſtances, they will become ſmall cones or pyramids;

" mids; in which form the lake muſt be
" ſuffered to dry, and the preparation is then
" completed."

If the lake thus prepared be of a deeper colour than be deſired, the proportion of ſcarlet ſhreds may be diminiſhed; or, if it be wanted yet deeper, they may be increaſed.

This lake, when the proceſs ſucceeds well, will be very bright, and will ſtand equally to any whatever; but it is not ſo tranſparent and fit for glazing as that where earth of alum is the baſis.

Lake may be prepared from cochineal in the following manner.

" Take two ounces of cochineal, and boil
" it gently in a quart of clean water. Filter
" the ſolution through paper, and then add to
" it two ounces of pearl-aſhes diſſolved in half
" a pint of warm water, and then filtered alſo
" through paper. Make then a ſolution of
" cuttle-fiſh-bone, as in the above proceſs:
" and to a pint of it add two ounces of alum
" diſſolved in half a pint of water. Put this
" mixture gradually to that of the cochineal
" and pearl-aſhes, as long as any ebullition
" appear to ariſe; and proceed as to the reſt
" according to the directions of the above pro-
" ceſs."

This lake will be very fine, if luckily managed, and will ſtand extremely well; it will alſo be very ſcarlet if the cochineal and anato be good.

Preparation of beautiful lake from Braſil wood.

“Take of Braſil wood (not coloured in the grinding by the addition of pearl-aſhes) three pounds, and boil it an hour in a ſolution of three pounds of common ſalt and three gallons of water, and then filter the fluid through paper while hot; prepare then a ſolution of five pounds of alum in three gallons of water, which add to the filtered ſolution of common ſalt tinged with the colour. Make alſo a ſolution of three pounds of the beſt pearl-aſhes in a gallon and a half of water, and purify it by filtering; put this to the other gradually, till the whole of the colour appear to be precipitated, and leave the fluid clear and colourleſs; but if any appearance of purple be ſeen, add a freſh quantity of the ſolution of alum by degrees, till a ſcarlet hue be produced. The proportion of alum muſt, however, in this caſe be nicely adjuſted; for a ſmall exceſs will cauſe part of the tinging matter to be diſſolved again, which will appear by the fluid's being coloured; and in ſuch caſe, a balance muſt again be made by the addition of a ſmall quantity of the ſolution of pearl-aſhes. When the fluid is thus rendered clear of colour, and the ſediment, being ſubſided, appears of a crimſon teint tending to ſcarlet, the directions

" in the firſt proceſs muſt be followed in every " point."

This lake cannot be confided in for either painting in oil or water; but in varniſh, or for any other purpoſe, where it is defended from air, it is ſuperior to any other whatever, on account of its great brightneſs and tranſparency.

It may be rendered ſafe, however, with reſpect to ſtanding, if half a pound of ſeed-lac be added to the ſolution of pearl-aſhes, and diſſolved in it before its purification by the filter; but, in this caſe, two pounds of the wood, and a proportionable quantity of the common ſalt and water, muſt be uſed in the coloured ſolution. This will produce a lake that will ſtand well in either oil or water, and will ſometimes be extremely beautiful, but it is not ſo tranſparent in oil as without the ſeed-lac.

The lake with Braſil wood may be made alſo with the addition of half an ounce of annatto to each pound of the wood, which will render it much more ſcarlet where it is ſo wanted. But the annatto muſt be diſſolved in the ſolution of pearl-aſhes; and not in that of the common ſalt along with wood.

The goodneſs of lake cannot be poſitively known but by the actual trial of it, which, with reſpect to its ſtanding, requires ſome time; but its other qualities may be more eaſily judged of.

With reſpect to the brightneſs, its merit may be eaſily proved by grinding a little of it on a palette or ſtone, with white lead and oil; where it may either be judged of by the memory of thoſe who are very converſant in the uſe of it, or by comparing it with a ſample of any other. In relation to the tranſparency, it is alſo eaſy to judge of it, by grinding a little in the ſame manner, with oil only, where a muddineſs will be perceived, if the lake be in the leaſt opake; or a little of it may be put in this ſtate, on the glaſs of a window, where its thickneſs or clearneſs will of courſe be apparent to the minuteſt degree. This indeed is the only method uſed in general by colourmen for deciding on all the qualities of lake; but it is very inconcluſive with regard to any but tranſparency. In reſpect to the ſtanding of lake, it is much more nice and difficult to determine; and indeed there can ſcarcely be any certainty about it but by actual experience. The colourmen having put a ſmall quantity of any which they are deſirous to try on a window, in the manner juſt before mentioned, let it ſtand there for ſome time to ſee if the colour fly. Other perſons think they have a more expeditious and certain, though leſs known method, by trying it with the juice of lemon; which, if the juice turn the lake to an orange colour, or make any other change in it, gives a proof, as they conclude, of the badneſs, or of the contrary, if no alteration be produced. But neither of theſe methods are infallible; for it is practicable to prepare lake which will undergo both theſe teſts, and yet not ſtand well when uſed in a picture; though the ſtanding the juice of lemon is ſome preſumption that the lake will hold its colour, and the being altered by it is a pretty certain proof of the contrary.

There is another defect, with reſpect to ſome purpoſes, which is apt to be found in lake; it is the fattening in oil. This can be only known by grinding ſome of it in the oil, and keeping it the proper time in bladders. When, if it be found to have this fault, it may be deemed utterly unfit for the uſe of colourmen. If, nevertheleſs, it have no other bad qualities, it is not at all the worſe for this, with regard to thoſe who have no occaſion to keep colours in bladders, but mix them as wanted on the palette.

There is another kind of lake brought from China, which is extremely beautiful; but as it will not mix well with either water or oil, tho' it diſſolves entirely in ſpirit of wine, it is not of any uſe in our kinds of painting hitherto. This lake has, by ſome unaccountable blunder, got the name of *ſafflower* among thoſe who paint in water, and has, indeed, been ſo called in more than one pamphlet written on the uſe of water colours. But there is not the leaſt affinity betwixt it and the real ſafflower, which is the dried flowers of the carthamus or baſtard ſaffron, and is a well known ſubſtance, as being a common dying drug.

Of roſe lake, commonly called roſe pink.

ROSE PINK is a lake like the former, except that the earth or baſis of the pigment is principally chalk, and the tinging ſubſtances extracted from Braſil or Campeachy (commonly called Peachy) wood.

As it never can be expected to ſtand when uſed with oil or water, it is ſeldom employed for any purpoſes but the coarſe work of houſe-painters, or for paper-hangings, unleſs ſometimes with varniſh, where it is ſecured from flying, and, when beautiful, may be diſtributed for lake.

Roſe pink may be prepared in the following manner.

" Take Braſil wood ſix pounds, or three " pounds of Braſil and three of Peachy wood. " Boil them an hour with three gallons of water, in which a quarter of a pound of alum " is diſſolved. Purify then the fluid by ſtraining through flannel, and put back the wood " into the boiler with the ſame quantity of " alum, and proceed as before; repeating " this a third time. Mix then the three " quantities of tincture together, and evaporate them till only two quarts of fluid remain; which evaporation muſt be performed firſt in the pewter boiler, and afterwards in the *balneo mariæ*, deſcribed p. 28. " Prepare in the mean time eight pounds of " chalk by waſhing over; a pound of alum

“ being put into the water uſed for that pur-
“ poſe, which, after the chalk is waſhed, muſt
“ be poured off, and ſupplied by a freſh
“ quantity, till the chalk be freed from
“ the ſalt formed by the alum; after which
“ it muſt be dried to the conſiſtence of
“ ſtiff clay. The chalk and tincture as
“ above prepared, muſt be then well mixed
“ together by grinding, and afterwards laid
“ out to dry where neither the ſun nor cold
“ air can reach it; though if it can be
“ conveniently done, a gentle heat may be
“ uſed.”

The goodneſs of roſe pink lies chiefly in the brightneſs of the colour and the fineneſs of its ſubſtance; which laſt quality depends on the waſhing well the chalk. The more the hue of roſe pink verges on the true crimſon, that is to ſay, the leſs purple it is, the greater its value.

Red ochre.

RED OCHRE is a native earth; but what is commonly uſed is made red by calcination; being yellow when dug out of the earth, and the ſame with the yellow ochre commonly uſed. It is chiefly brought from Oxfordſhire, where it is found in great plenty, and burnt afterwards, by thoſe who prepare it, in large ovens. The quality it has, in common with other ochres, of ſtanding infallibly, renders it very uſeful, as well in the more delicate as in coarſer paintings in oil, notwithſtanding it is not bright. But in order to its being fit for nicer purpoſes, it ought to be waſhed over; though for others, it may be uſed in the ſtate in which it is found in the ſhops.

The cheapneſs of red ochre renders it ſcarcely worth while to adulterate it; but, either from ſuch practices, or from the difference of their natural ſtate, ſome parcels are greatly better than others. The marks of goodneſs are brightneſs of colour, and the being of a crumbly chalky texture, ſhewing no gritty roughneſs when rubbed betwixt the fingers.

CLASS II. Of blue colours.

Of ultramarine.

ULTRAMARINE is a preparation of calcined *lapis lazuli.* It is, when perfect, an extreme bright blue colour, with a tranſparent effect in oil, and in ſome degree in water, and will ſtand, when uſed in painting, without the leaſt hazard of flying, with whatever vehicle or pigment it be mixed. For theſe reaſons, ultramarine is of the higheſt value in every kind of painting, being equally ſerviceable in all, even in enamel; and though the invention of Pruſſian blue, on account of its much lower price, has greatly leſſened the uſe of it, yet this excluſion of it may be conſidered as an injury to painting in general, as the ſkies of landſcapes, and many other parts of modern pictures, ſhew the loſs of it by their changing from a warm, or clear blue, to a faint greeniſh or olive teint.

There have been a great variety of methods taught and practiſed for preparing the ultramarine. The older methods were, after a calcination in a crucible, to mix a compoſition of pitch, reſin, Burgundy pitch, ſoap, wax, and other ingredients, and to form a paſte of them with the calcined matter. This paſte was then put into water for ſeveral days, and afterwards diſſolved, by ſucceſſive quantities of warm water poured on it, till it let go the colour of the calcined *lapis lazuli*, which was recovered by the ſame means as is directed for the waſhing over colours in p. 42. This method however of employing a variety of ingredients in the cement was not only unneceſſary, but injurious to the colour, which was never perfectly freed by the warm water from them; and for this reaſon, the methods have been continually varied by thoſe who have attempted to prepare this pigment. I ſhall however give the beſt of the more modern, and ſubjoin one of older date, which I believe, nevertheleſs, to be equally good, though not near ſo troubleſome.

"Take the *lapis lazuli*, and break it into "very ſmall pieces, or rather a groſs powder. "Put it into a crucible, and cover it ſecurely, "to prevent the coals from falling amongſt it.

“Calcine it then with a ſtrong fire for an hour if there be any large quantity, or leſs time in proportion, and quench it, when taken out of the fire, in vinegar; ſtirring them well together, and ſuffer it to remain in that ſtate for a day or two. Pour off then the vinegar, except what may be neceſſary for moiſtening the calcined *lapis lazuli* in grinding, which operation it muſt then undergo, in a mortar of flint or glaſs, till reduced to the greateſt degree of fineneſs thoſe means may effect. But, if it appear yet too hard to be eaſily ground, give it another ſhort calcination, and quench it a ſecond time in vinegar. The vinegar muſt then be waſhed off from the powder, by the putting it to ſeveral ſucceſſive quantities of clean water; each of which muſt be poured off when the *lapis lazuli* has been well ſtirred about in them, and is again ſettled to the bottom. It muſt then be ground on a porphyry ſtone, with a muller, till it be perfectly impalpable, and then dried; in which ſtate it is duly prepared to mix with the following cement.—Take of Burgundy pitch, nine ounces,—of white reſin, and Venice turpentine, ſix ounces,—of virgin wax one ounce and a half,—and of linſeel oil one ounce and a quarter. Mix them together by melting in a pipkin over the fire; and ſuffer them to boil till they acquire ſo ſtiff a conſiſtence that, being dropt into water while of this boiling heat, they will not

“ ſpread on the ſurface of it, but form a roundiſh maſs or lump. The cement being thus formed, may be poured out of the pipkin in the water, and made into cakes or rolls for uſe. Of this cement, take an equal weight with that of the calcined *lapis lazuli*, and melt it in a glazed earthen pipkin; but not ſo as to render it too fluid. Then add to it the calcined matter by very ſlow degrees, ſtirring them together with an ivory ſpatula till the whole appear perfectly mixed. Being thus mixed, heat the compoſition to a ſomething greater degree, and caſt it into a large baſon full of cold water. When it has cooled to a conſiſtence to bear ſuch treatment, knead it well like the dough of bread, with the hands rubbed over with linſeed oil, till all the parts be thoroughly incorporated with each other. Then make the maſs into a cake, which may be either kept till ſome other convenient time in cold water, or immediately proceeded with in the following manner. Put the cake into an earthen diſh or baſon; the bottom of which ſhould be rubbed with linſeed oil, and pour on it water of the warmth of blood. Let it ſtand a quarter of an hour; and as the water ſoftens the cake, it will not looſe the fineſt part of the calcined matter; which, on gently ſtirring the water, but without breaking the cake or ſeparating it into leſſer parts, will be ſuſpended in the water; and muſt be pour-

" ed off with it into another veſſel. The " quantity of water muſt be then renewed, " and the ſame operation repeated a ſecond or " third time; and as the maſs appears ſlack " in affording the colour, it muſt be moved " and ſtirred, in the manner of kneading, " with the ivory ſpatula, but not broken into " fragments or ſmall parts; and when ſo " much of the colour is extracted as to " render it neceſſary for the obtaining more, " the heat of the water muſt be increaſed " to the greateſt degree. The quantities of " the calcined matter (which is now the " ultramarine) that were firſt waſhed off, " and appear of the ſame degree of deepneſs " and brightneſs, may be put together, and " the ſame of thoſe of the ſecond degree, " the laſt waſhings making a third. The " water being then poured off from each of " theſe parcels, put on a lixivium formed of " two ounces of ſalt of tartar, or pearl-aſhes, " diſſolved in a pint of water, and filtered " through paper after the ſolution is cold. " This lixivium muſt be put on boiling hot, " and the ultramarine ſtirred well about in it, " and then the mixture ſet to cool. The " powder being ſubſided, the clear lixivium " muſt be poured off, and clean water put in " its place, which muſt be repeated till the " whole of the ſalts of the lixivium are waſhed " away. The ultramarine muſt afterwards " be dried, and will be then duly prepared " for uſe."

" Another method of purifying the ultra-
" marine from the cement may be uſed, which
" is the pricking the yolks of eggs with a pin,
" and moiſtening the matter to be purified
" with the ſoft part that will run out, and
" working them together in a glaſs or flint
" mortar; after which the mixture muſt be
" put into the lixivium, and proceeded with
" as is above directed.

" In order to free the ultramarine from that
" part of the water which cannot be poured
" off from it without carrying away part of
" the powder, let it be put in a deep pot, ſuch
" as the cups made for coffee. After the
" whole is poured off that can be without loſs,
" ſet the pot ſo on a table or ſtand that ſtrings
" put into it may hang below the bottom.
" Then take three or four thick threads of
" looſe twiſted cotton, and having wet them,
" put one end of each into the fluid; and let
" the other, being brought over the edge of
" the pot, hang three or four inches below
" the bottom of it. By this means the water,
" being attracted by the threads, will drop
" from the lower end till the whole be nearly
" drained away. The matter may then be
" poured upon a porphyry, or poliſhed marble,
" and ſuffered to dry."

The other method I have propoſed to give differs from the above only in the uſing virgins wax and the beſt white reſin melted together in equal quantities, inſtead of the more compound cement; and this gives up the colour, on its being infuſed in warm water, much ſooner than the other.

The other methods of preparing ultramarine differ chiefly in the manner of ſeparating the colour from the cement and feculencies; which ſome recommend to be done by ſqueezing and working the maſs with the hand in warm water, after it has lain in ſome time to ſoften. Others adviſe the putting the maſs in the form of a flat cake on a board in a ſituation ſomewhat declining from an horizontal poſition, and making water drop on the board above the cake, that it may flow through it, and waſh out the ultramarine; to facilitate which, the parts of the cake muſt be frequently opened and ſtirred with a ſtick. But this method is more troubleſome and leſs efficacious than that above given.

Ultramarine may be alſo prepared without any cement, by calcining it; and when levigated and waſhed over, ſoaking it in diſtilled vinegar made hot. The ultramarine will, in this way of preparation, be produced in greater quantities; but it will be lighter coloured than when refined by the cement. It is, however, a very good method of preparing it for the painting ſkies, and ſome other uſes.

As it is of the laſt conſequence to the producing fine ultramarine that the *lapis lazuli*, of which it is made, ſhould be good, this may be judged of by inſpection from the deepneſs and clearneſs of the blue colour; and in order to be more certain of the value, it is proper to heat a ſmall piece red hot; which, if it retain afterwards its hardneſs and colour, may be accounted good. But if it become crumbly and turn brown, or appear to have ſpecks of dulneſs, it may then be juſtly ſuſpected, or rather condemned.

The different parcels of ultramarine produced from the ſame parcel of *lapis lazuli*, according to the above proceſs, will differ greatly in their value: the manner of judging of which muſt be by the degree of brightneſs and deepneſs of the colour. There is however no being preciſely certain of the worth of any, but by comparing it with a ſpecimen of known value; and to do that with great accuracy, a little of each ſhould be thinly rubbed on white paper, or mixed with white flac and oil, by means of the palette-knife, ſo as to form light teints of the ſame degree; where the brightneſs will ſhew itſelf more diſtinguiſhably than in darker.

Ultramarine, on account of its great price, is ſubject to be adulterated. This may be done by two ſubſtances, viz. a precipitation or magiſtery of copper made by alkaline ſalt, and fine ſmalt. The firſt of theſe is the moſt injurious, becauſe the magiſtery of copper, if the ultramarine ſophiſticated with it be uſed in painting either with oil or water, will change its hue and turn black, particularly in oil; and in enamel painting, as ſoon as fluxed, it will become a green, and conſequently make the effect of the ultramarine vary from what is intended. The latter, that is, the adulteration with fine ſmalt, is more difficult to be performed, on account of the hardneſs of the ſmalt, which being in fact a hard kind of glaſs, is ſcarcely to be levigated by art, ſo as to be equally fine with the ultramarine, rendered impalpable by the calcination it has undergone. This adulteration of ultramarine with ſmalt does not deprave it with relation to enamel painting, as it will flux with the ſame proportionable teint according to the appearance which it has in its ſimple ſtate; and uſed as a water colour, it will ſtand equally well with that unſophiſticated; but in oil painting, though it will ſtand well, yet it will never mix kindly with the oil, but fall from it if the mixture be very moiſty, or form a paſty ſubſtance, if it be ſtiffer, that will not work freely.

The adulteration of ultramarine, by the magiſtry of copper, may be eaſily detected, by pouring ſome diluted ſpirit of nitre on a ſmall quantity, which, if there be any copper, will ſoon diſſolve, and form a greeniſh blue ſolution. The adulteration with fine ſmalt is more difficult to be diſtinguiſhed if the ſmalt be finely levigated. One of the moſt certain methods of diſcovering it, is to put ſome of the ſuſpected ultramarine into a cup of clear water and waſh it over, examining the groſſer part, if any there be, which remains when the finer is thus ſeparated from it. By this means the ſmalt, if there be any, not being near ſo finely pulverized as the ultramarine, will be left.

and being thus ſeparated and compared with the ultramarine divided from it, the difference will become very ſenſible. The adulterated may likewiſe, if the proportion of ſmalt be not very ſmall, be diſtinguiſhed from the pure by trying with oil on the principle before mentioned, that ſmalt will not mix ſo kindly with oil as ultramarine. A very fine kind of ſmalt, loaded ſtrongly with the colour, has been ſometimes impoſed for a coarſe kind of ultramarine; but the difference of their working in oil will eaſily afford the means of diſtinguiſhing them, and if they be tried in enamel painting, the ſmalt will flux without any addition, being itſelf a glaſs, which is otherwiſe with reſpect to the ultramarine, as it always requires the addition of ſome vitreous body to flux it.

Of ultramarine aſhes.

The pigment called ULTRAMARINE ASHES, is the reſiduum or remains of the *lapis lazuli*, after the ultramarine has been extracted from it by the above given, or any ſimilar proceſs; but as the coloured particles which remain are mixt with thoſe of another kind contained in the *lapis lazuli*, whether earths or metalline ſubſtances, theſe aſhes muſt of courſe be much leſs valuable than even the worſt ultramarine. Sometimes, nevertheleſs, when the operation of the extracting the colour from the calcined *lapis lazuli* has not ſucceeded well, a conſiderable ſhare of the ultramarine is left behind with the recrement, and greatly enhances the worth of the aſhes; and indeed, as it is certain that what colour they poſſeſs, when genuine, will never fly, they always bear a good price. The appearance of theſe aſhes is, that of ultramarine a little tinged with red, and diluted with white. But they are frequently adulterated, and made by the ſophiſtication to look better than they would in a genuine ſtate. This adulteration renders them much leſs certain of ſtanding, if, as it is moſt frequently the caſe, it be made by precipitating copper in the manner before mentioned in the caſe of the adulteration of the ultramarine. This is eaſily, however, detected by the method above given, of putting ſome of it into a ſmall quantity of ſpirit of nitre, which, if there be any copper in it, will be tinged green. The ultramarine aſhes are alſo ſometimes adulterated with ſmalt, as well as the ultramarine itſelf; and the conſequences of the ſophiſtication are the ſame in this caſe as were before mentioned of the other. The means of detection are alſo the ſame. As the ultramarine aſhes will not flux without the addition of ſome vitreous body; while, on the other hand, the ſmalt, being glaſs, requires no ſuch addition to its fluxing with a proper heat.

The method of preparing the ultramarine aſhes is as follows.

"Take the cement of the ultramarine "which remains after the colour is extracted,

" and mix it with four times its weight of lin-
" ſeed oil. Let the mixture be ſet in a glazed
" pipkin over the fire, and when it is thus
" boiled a ſhort time put it into a glaſs veſſel,
" ſufficiently large to contain it, of a cylin-
" drical figure, of which veſſel the diameter
" muſt be ſmall in proportion to the length.
" But care muſt be taken that the matter,
" when put into this glaſs, be cool enough
" not to endanger the breaking it. This glaſs
" muſt then be put into a *balneum mariæ*;
" which muſt be made as hot as poſſible
" without boiling, and kept there till the
" colour appear to be all ſubſided to the bot-
" tom. The oil muſt then be poured off till
" the colour appear to riſe with it, and the
" remainder, with the colour in it, muſt be
" put into another glaſs of the ſame kind with
" as much freſh oil as will riſe five or ſix
" inches above the colour. This glaſs muſt be
" treated in the ſame manner as the firſt, and
" when the colour has ſubſided, the oil muſt
" be poured off, and a freſh quantity put in
" its place. This having been likewiſe poured
" off, the colour muſt then be well waſhed,
" to free it from the remaining oil, firſt in
" boiling water, and afterwards in ſome of
" the lixivium above-mentioned made boiling
" hot alſo. As much of the lixivium being
" poured off, when the colour has ſubſided,
" as can be ſeparated from it that way, the
" colour muſt be thoroughly freed from the
" remainder by frequent ablutions with clean

" water; after which the water muſt be taken
" off by the means above directed for the ultramarine, till the matter be of a proper degree of moiſture for grinding. It muſt then be thoroughly well ground on a porphyry and waſhed over, that all the harder and inſufficiently calcined parts may be reduced to an impalpable powder; in order to which, the remaining groſſer parts, after the finer have been ſeparated by the waſhing over, muſt be again ground till the whole be perfectly fine. The ſame means muſt be afterwards uſed to bring the aſhes to a dry powder that were before directed for the ultramarine."

Of Pruſſian blue.

PRUSSIAN BLUE is the fixt ſulphur of animal or vegetable coal, combined with the earth of alum, and may be made from almoſt any animal, and many kinds of vegetable ſubſtances; though from reaſons of experience, it is generally made of the coal of blood only. It is uſed in all kinds of painting except enamel, and is prepared of many different degrees of brightneſs, and ſtrength, as well as of different teints, ſome parcels being, though rarely, of a true unmixed blue, but the far greateſt part of a purple hue; though the proportion of the tinge of red, which cauſes the tendency to purple, is frequently in degree various, according to the different manner of, or accidents attendant on the management of the proceſs. With reſpect to ſtanding, Pruſſian blue can neither be eſteemed the moſt perfect, nor the moſt faulty colour. When it is very dark, that is, when the tinging particles bear a large proportion to the earth, or baſis, it will ſometimes ſtand extremely well; but it is apt then to want brightneſs and be very purple. On the other hand, when it is light, or with a ſmall proportion of the tinging part, it is more frequently bright and cool, as it is called, that is, clear of any mixture of red; but extremely ſubject to fly, or to turn to a greyiſh green. This is not however univerſal, for I have ſeen ſome very dark which has been pretty bright and cool, as likewiſe ſome that has been light which would ſtand perfectly well. The common Pruſſian blue, however, found in the ſhops, which is prepared almoſt wholly at preſent by ignorant and ſordid people, and ſold at very low prices, can be very little depended upon in paintings of conſequence. Whoever therefore would have this pigment perfect, ſhould either prepare it, or procure it to be prepared in the proper and true manner; and then, conſidering the high price of ultramarine, and the foulneſs of indigo, it may be deemed an acquiſition to the art of painting.

The Pruſſian blue may be prepared in perfection by the following proceſs.

" Take of blood, any quantity, and evapo-
" rate it to perfect dryneſs. Of this dry blood
" powdered, take ſix pounds, and of the beſt

" pearl-aſhes two pounds; mix them well " together in a glaſs or ſtone mortar, and then " put the mixt matter into large crucibles or " earthen pots, and calcine it in the furnace " deſcribed, p. 23, the top of the crucible " or pot being covered with a tile, or other " ſuch convenient thing, but not luted. The " calcination ſhould be continued ſo long as " any flame appears to iſſue from the matter, " or rather till the flame become very ſlender " and blue; for if the fire be very ſtrong, a " ſmall flame would ariſe for a very long time, " and a great part of the tinging matter would " be diſſipated and loſt. When the matter " has been ſufficiently calcined, take the veſſels " which contain it out of the fire, and as " quickly as poſſible throw it into two or " three gallons of water, and as it ſoaks " there, break it with a wooden ſpatula, that " no lumps may remain; put it then in a " proper tin veſſel, and boil it for the ſpace " of three quarters of an hour or more. Filter " it while hot through paper in the tin cul- " lenders, deſcribed page 28, and paſs ſome " water through the filter when it is run dry, " to waſh out the remainder of the lixivium " of the blood and pearl-aſhes; the earth re- " maining in the filter may be then thrown " away. In the mean time diſſolve of clean " alum four pounds, and of green vitriol or " copperas two pounds in three gallons of " water. Add this ſolution gradually to the " filtered lixivium, ſo long as any efferve-

"ſcence appear to ariſe on the mixture; but "when no ebullition or ferment follows the "admixture, ceaſe to put in more. Let the "mixture then ſtand at reſt, and a green pow-"der will be precipitated; from which, when it "has thoroughly ſubſided, the clear part of "the fluid muſt be poured off, and freſh wa-"ter put in its place, and ſtirred well about "with the green powder, and, after a proper "time of ſettling, this water muſt be poured "off like the firſt. Take then of ſpirit of ſalt "double the weight of the green vitriol, which "was contained in the quantity of ſolution "of vitriol and alum added to the lixivium, "which will ſoon turn the green matter to "a blue colour; and after ſome time add a "proper quantity of water, and waſh the co-"lour in the ſame manner as has been directed "for lake, &c. and when properly waſhed, "proceed in the ſame manner to dry it in "lumps of convenient ſize."

By the proportions as given in this proceſs, if it be rightly conducted, the Pruſſian blue produced will be both deep and bright; but where it is deſired to be of a lighter colour, the quantity of dried blood muſt be leſſened; for if it be even reduced to one half, a beautiful light blue may be made. The proportion of vitriol may, if only half the proportion of blood be uſed, be alſo reduced to half, and likewiſe the ſpirit of ſalt in proportion to that; the only uſe of ſuch ſpirit being to re-diſſolve the ochre or iron precipitated from the vitriol.

But if any abatement be made in the quantity of vitriol, an equivalent weight of the alum muſt be ſubſtituted in its place, that there may be a ſufficient proportion of one or other of theſe ſalts to precipitate the ſulphur of the blood from the lixivium.

If the quantity of ſpirit of ſalt preſcribed fail, however, to convert the precipitated matter from green to perfect blue, a greater proportion muſt be uſed; for though the quantity directed be fully ſufficient when the ſpirit is of due ſtrength, yet as it is frequently found weak when purchaſed of the chymiſts, or thoſe who ſell it, there can be no certain dependence laid on any rule, without obſerving that the effect be correſpondent.

Pruſſian blue, when made in great quantities, may, for expedition, be dried by heat, and this may be performed by means of a ſmall furnace, conſtructed in the following manner; let a horizontal funnel of brick-work be built, with a vent at one end, opening into a chimney. This funnel muſt be of ſuch breadth as will admit its being covered by plates of tin, and its length muſt be regulated by the quantity of matter there may be occaſion to dry. The plates of tin ſhould be well varniſhed over, as well on the under as upper ſide, by drying oil boiled to a thick conſiſtence and black colour, and then rendered again fluid by means of oil of turpentine. They ſhould be cemented to each other, where they join, by putty mixed with the above varniſh; but they may be fixed to the brick-work, which they reſt upon by fire-lute and Dutch, or other tiles, laid over the edges. In the front of this funnel muſt be made a ſmall-fire-place for burning charcoal, which muſt vent itſelf into it inſtead of a chimney. The Pruſſian blue to be dried muſt be laid in the form of a cake upon theſe tin plates, and then ſcored acroſs with a piece of horn both ways, by which means as the moiſture exhales and the maſs ſhrinks, each ſquare, formed by the ſcoring, will be a ſeparate lump. Ochres, and all other earths, as alſo vermilion, may be dried in the ſame way on theſe plates: but as thoſe ſubſtances have nothing gummy or adheſive in their texture, they may be laid on paper upon the plates, which will prevent their contracting any foulneſs from them.

The goodneſs of Pruſſian blue muſt be diſtinguiſhed by its brightneſs, deepneſs, and coolneſs; and where theſe qualities are found together in any parcel, it may be depended upon that it will ſtand well; for whatever is added to it to ſophiſticate it, or whatever is done amiſs in the proceſs, will always render it more foul and purple. The moſt certain way to judge of it is therefore to try it with white lead, or flake white and oil, where the above qualities will diſplay themſelves, or appear wanting, in a much more diſtinguiſhable manner than in the lumps of the unmixed pigment. In the preparation of the coarſer kind of common Pruſſian blue, a great part of the ochre or iron precipitated from the vitriol is left in the pigment; but in good Pruſſian blue there ought to be no iron, for in time it overpowers the blue of the ſulphur of the coal, and ſhews its own proper tinge of yellow in the paint, as may be ſeen in all blue wainſcots, or other work done by houſe-painters; which in a ſhort ſpace of time turn to an olive or greeniſh grey colour. The preſence of iron in Pruſſian blue may be diſcovered by boiling a ſmall quantity of what is ſuſpected in a lixivium of pearl-aſhes, to make a ſeparation of the colour from the remaining earth; which, if it partake of the other, will appear yellow when waſhed and dried; but if free from it, white or grey.

Of verditer.

VERDITER is the mixture of chalk and precipitated copper, which is formed by adding the due proportion of chalk to the ſolution of copper, made by the refiners in precipitating the ſilver from the *aqua fortis*, in the operation called parting, in which they have occaſion to diſſolve it, in order to its purification. Verditer is, when good, a cool full blue, but without the leaſt tranſparency either in oil or water. It is of a moderate degree of brightneſs, and would have conſequently a conſiderable value in the nicer paintings, where it would ſupply the place of ultramarine, or at leaſt of the ultramarine aſhes, if it could be depended upon. But in oil it is very ſubject to turn greeniſh, and ſometimes black; and in water, where it is ſafer, it is yet not always found to hold. For which reaſons it is rejected, except in paper-hangings and other coarſe work, or in varniſh, where this objection to it ceaſes.

Verditer is only to be had at a cheap rate from the refiners, who are at no expence in the making it, but that of the chalk and labour, as they could find no other uſe for the ſolution of copper made by precipitating the ſilver from the *aqua fortis*, in one of their moſt common operations, were they not to apply it to this. The manner in which it may be beſt done by them is as follows.

"Take any quantity of chalk, and having "rendered it properly fine by waſhing over "carefully, add it gradually to the ſolution of "copper, ſo long as any change appears to be "produced by it from the ebullition excited: "or the due proportion may be perceived by "the fluid's loſing its green tinge and becom"ing colourleſs. Let it then ſtand at reſt till "the ſediment be ſubſided, and pour off the "clear part of the fluid from the powder; "adding in its place clean water, which muſt "be ſeveral times renewed till the ſalts be en"tirely waſhed out. The ſediment, which "is the verditer, muſt be afterwards freed from "the fluid by filtering through paper covered "with a cloth, and laid out in lumps of a "middling ſize to dry."

The verditer as commonly ſold requires no ſubſequent preparation for its being uſed; only where, as is frequently the caſe, from uſing ſuch chalk in the making of it as is not purified, it is found gritty, and not ſufficiently fine, and ſhould then be freed from this grit or foulneſs by waſhing over.

Thoſe who deſire to make verditer themſelves, may prepare the ſolutions of copper, by adding copper filings gradually to *aqua fortis* of any kind, or putting plates of copper into it, and then proceeding as is above directed for the refiners ſolution. It is not ſo expenſive, when prepared in this manner, but that it will well anſwer to thoſe who cannot conveniently procure that prepared by the refiners.

Verditer is not ſubject to be adulterated, as nothing cheaper of the ſame appearance can be mixed with it. Its goodneſs muſt be diſtinguiſhed by the darkneſs and brightneſs of the colour: and that is likewiſe to be preferred which is of the fulleſt blue teint, and not inclining to green, as it may be inferred from thence that the colour will ſtand the better. A much deeper and brighter kind of verditer may be made, by uſing a filtered ſolution of pearl-aſhes, in the place of the chalk, and proceeding, as to all other particulars, according to the above directions.

Bleu de cendres, *or ſanders blue.*

This colour, or rather name, is of late introduction, and has taken its riſe, in all probability from ſome French painters having taught the uſe of verditer in water colours under the name *cendre bleu*, which the French in common ſtyle give to it. This has been corrupted into ſanders blue, and the late writers, who have pretended to teach the art of painting in water colours, &c. have, amongſt other blunders and abſurdities, ſpoken of this as a diſtinct colour from verditer, known and in common uſe. There is nothing, however, to be found, on the moſt diligent inquiry, in the colour-ſhops, under this name, but common verditer, or a ſpecies of it where the precipitation of the copper appears to be made in part upon ſtarch, as well as chalk. But this by no means anſwers the deſcription of the author of a pamphlet publiſhed by Mr. Peel in the year 1731, who ſays, "Sanders "blue is of very good uſe, and may ſerve as "a ſhade for ultramarine or the blue bice, "where the ſhades are not required to be ex- "tremely deep, and is of itſelf a pleaſant blue "to be laid between the lights and ſhades of "ſuch a flower as is of a mazarine blue." By which it is plain the ſanders blue meant here cannot be any kind of verditer, as that is always lighter than the ultramarine itſelf, and can therefore never be a ſhade to it: unleſs the ſpecies of verditer mentioned above has been prepared darker than at preſent, as is practicable, and ſold under ſuch a name, this author muſt have made ſome miſtake, or impoſed upon the public, by writing what occurred to his imagination without regard to fact.

If any, however, may deſire to prepare a dark verditer, of the kind here ſpoken of, they may do it in the following manner.

"Take of the refiners ſolution of copper "made in the precipitation of ſilver from the "ſpirit of nitre; or diſſolve copper in ſpirit of "nitre or *aqua fortis*, by throwing in filings, "or putting in ſlips of copper gradually, till "all effervesſcence ceaſe. Add to it of ſtarch, "finely powdered, the proportion of one-fifth "or ſixth of the weight of the copper diſſolved. "Make then a ſolution of pearl-aſhes, "and filter it, and put gradually, to the ſolution "of copper, as much as will precipitate "the whole of the copper, which may "be known by the fluid's becoming clear and "colourleſs, though before highly tinged with "green. Waſh the powder, which will be "precipitated, in the manner directed for "lake, &c. and, when it is ſo well drained "of water by means of a filter as to be of a "proper conſiſtence, grind the whole well together, "and lay it out to dry."

Of indigo.

INDIGO is a tinging matter extracted from certain plants by means of putrefaction, and a coagulation by the air. It is brought from the Eaſt and Weſt-Indies, and cannot, as far as is hitherto known, be prepared in theſe colder climates, on account of the tender nature of the plants which produce it. It was formerly almoſt the only blue colour uſed in painting, either with oil or water, except ultramarine, which, from its great price, could only be applied to very nice purpoſes. But, at preſent, the invention of Pruſſian blue, and the foulneſs of the indigo brought from the French or our own plantations, which is greatly inferior in brightneſs to that made in the Spaniſh Weſt-Indies, which was formerly imported here, have almoſt baniſhed the uſe of it as a paint, except for paper-hangings, or ſuch groſs uſes. Where the beſt Spaniſh indigo, nevertheleſs, can be procured, it is preferable for many purpoſes to Pruſſian blue, of the ſame degree of brightneſs, from its certainty of ſtanding; but it is never found either of the firſt degree of brightneſs, nor ſo cool as to be fit for all the uſes to which Pruſſian blue can be applied.

There is no other preparation neceſſary to the uſing indigo in painting, except a perfect levigation, to which, for nicer purpoſes, waſhing over may be added.

The goodneſs of indigo may be diſcerned by its darkneſs and brightneſs; and, as it is always apt to be purple, coolneſs gives a great additional merit to the beſt for the uſes of painting.

Of ſmalt.

SMALT is glaſs coloured with zaffer, and ground only to a very groſs powder. Its texture does not permit it to be worked with either bruſh or pencil; but it is uſed for ſome purpoſes, by ſtrewing it on any ground of oil-paint while wet; where it makes a bright warm blue ſhining ſurface, proper for large ſun-dials, and other ſuch applications.

It is prepared from fluxing zaffer with glaſs of ſalts; the proportion of which may be one-ſeventh part, or more or leſs, according to the degree of deepneſs required in the ſmalt. It is uſed alſo in enamel painting, and in painting on glaſs, for which purpoſes it is of great uſe.

The goodneſs of ſmalt conſiſts in its being dark, bright, and cool, though it always verges on the purple.

Beſides the common kind of ſmalt, there is a very fine ſort made in Saxony, but prohibited, under great penalties, from being carried out of the country; it has, however, been brought hither, and ſold ſometimes under the name of ultramarine, and at others under its own name. The price has always been high, but has varied from ſix guineas an ounce to fifteen ſhillings, in conſequence of quantities procured by Jews in Saxony at a low rate, in conſequence of the Pruſſians ſeizing all the works of this kind during the late war. This ſort of ſmalt is not made of zaffer, but of the fineſt calx of cobalt, free from the ſand which enters into the compoſition of zaffer mixt with ſome proper flux. It is exceedingly ſtrong of colour, and dark; and therefore ſerves for many purpoſes which ultamarine and common ſmalt cannot ſo well anſwer. It is much harder than the common ſmalt, and therefore requires ſome flux to be added. It may be diſtinguiſhed from ultramarine, not only by its dark hue, but by the trial with fire abovementioned, in the caſe of common ſmalt. For though it will not run perfectly without ſome flux, yet it will become a hard ſemivitrified maſs, if urged with a ſtrong heat, while the ultramarine, in the ſame degree of heat, will remain a powdery calx as before its being expoſed to the action of the fire.

Of bice.

BICE is ſmalt reduced to a fine powder by levigation. It is a light warm blue colour, and was formerly uſed in oil, more frequently in water colours; but from its unſuitable texture it is now greatly diſuſed.

Its goodneſs lies in the brightneſs and coolneſs. This holds good only of the original and true bice; for at preſent ſeveral compoſitions of indigo and verditer, with chalk or other cheap ſubſtances, are ſold in the name of bice.

Of litmus, or lacmus.

LITMUS is a blue pigment brought hither from abroad, and formed from archal, a ſpecies of moſs, brought from the Canary and Cape de Verd iſlands, being in fact the ſame with that from which the purple tincture called archal, below treated of, is made. It is only uſed in miniature paintings, and cannot be there well depended upon, as the leaſt approach of acid changes it inſtantly from blue to red; though it will ſtand if no ſuch accident intervene.

Litmus is brought from Holland at a cheap rate, and will go ſo far in painting with water colours, the only kind of painting where it can be uſed, that it is needleſs to give the preparation. But if any are deſirous, for curioſity, to know the proceſs, it is thus performed.

" Add quick-lime and putrefied urine, or
" ſpirit of urine diſtilled from lime, to the
" archal, previouſly bruiſed by grinding.
" This mixture muſt be ſuffered to ſtand till
" it acquire a very blue colour. After which
" the fluid muſt be ſuffered to evaporate, and
" the remaining maſs, when it be of the con-
" ſiſtence of a paſte, muſt be laid on boards
" to dry in ſquare lumps."

The goodneſs of litmus may be judged of by the brightneſs and dulneſs of its colour. But the beſt is worth little for painting, as it is very apt to change and fly.

CLASS III. Of yellow colours.

Of King's yellow.

KING's YELLOW is a pure orpiment, or arſenic coloured with ſulphur. It is uſed for painting in oil and varniſh, and is of an extreme bright colour, and, when good, a true yellow; it will likewiſe ſtand well, being uſed alone, but when mixed with white lead and ſeveral other pigments, its colour flies or changes. On this account, and for the additional reaſons of its being eſteemed a poiſon, and having a moſt nauſeous ſmell, it is rejected by many. Others, nevertheleſs, find too much advantage in its great brightneſs, as well in the uſe of it as a yellow, as when mixed with blue pigments to form a green, not to have recourſe to it on ſome occaſions.

This pigment muſt be prepared by mixing ſulphur and arſenic by ſublimation, which may be done in the following manner.

"Take of arſenic powdered and flowers of "ſulphur in the proportion of twenty of the "firſt to one of the ſecond; and having put "them into a ſublimer, ſublime them in a "ſand-heat with ſuch a furnace as is de-"ſcribed p. 21, according to the general di-"rections given p. 32. The operation be-"ing over, the King's yellow will be found "in the upper part of the glaſs, which muſt "be carefully ſeparated from any *caput mor-*

" *tuum* or foul parts that may be found in the " glaſs with it. It muſt be afterwards reduced " to an equal powder by levigation."

It may likewiſe be obtained from common orpiment, by ſubliming it, inſtead of the arſenic and ſulphur, in the ſame manner; but the produce will be ſmall in this method.

The King's yellow may be rendered warmer, that is, more inclined to orange, by increaſing the proportion of the ſulphur; or the contrary effect may be produced by diminiſhing it.

King's yellow cannot be adulterated without diminiſhing its brightneſs; and therefore that, which is beſt in this reſpect, may be eſteemed good in others. Coolneſs, or the being free from red, is likewiſe a merit.

Of Naples yellow.

NAPLES YELLOW is a warm yellow pigment rather inclining to orange, but in a very minute degree. It is ſeldom uſed but in painting with oil, where it is generally found to ſtand well; but, if it touch iron along with the leaſt watery moiſture, it will be changed by it. As it is brighter than moſt yellows uſed in oil, and indeed than all at preſent in uſe, except the King's yellow, it is much received into practice. It has been ſuppoſed to be a native earth, and is ſaid to be found in the neighbourhood of Naples; but this is dubious, as the different parcels of it vary too much from each in ſpecific qualities to allow the ſuppoſition

tion of their being native earths of the ſame kind, at leaſt with reſpect to ſuch as are to be obtained from our ſhops; for I have met with ſome that was of a very different compoſition from the common. The uncertainty with regard to the genuineneſs renders this pigment leſs valuable, as it is leſs to be depended upon with reſpect to its holding its colour. Whether, however, it is an earth that is at preſent generally ſophiſticated, or what the preparation of it is, we are at preſent ignorant, as it is brought from abroad. This makes it more difficult to give marks of its genuineneſs; which may therefore be beſt gathered from its appearance, and manner of mixing with the oil, in which the more adulterate kinds differ from the common.

Though Naples yellow is of a gritty texture, yet it is beſt to uſe it as it is obtained, and only grind it with the oil, for it does not well bear levigation with water. But if ſuch levigation be nevertheleſs practiſed on it, the greateſt care muſt be taken to employ an ivory ſpatula in the place of a palette-knife, which would certainly injure the colour if it were touched with it while wet; and even when moiſtened with oil, the iron is in ſome degree injurious to it.

Of yellow ochre.

YELLOW OCHRE is a mineral earth, which is found in many places, but of different degrees of purity. When free from other earths and heterogeneous matter, it is a true yellow of moderate brightneſs; and, as its texture ſuits it for all kinds of painting, and that it will never fly in the leaſt, it is a very valuable colour with reſpect to its utility, though of low price.

There is no other preparation of yellow ochre neceſſary than levigation, and for nicer purpoſes waſhing over, to undergo which its texture is extremely ſuitable.

The goodneſs of yellow ochre may be diſtinguiſhed by the brightneſs and fulneſs of its yellow colour, and if it be bright it cannot be too cool. There are ſome kinds of yellow ochre which are very bright, and which being well prepared by waſhing are ſold by ſome colourmen at a conſiderably greater price than the common. But theſe better kinds are counterfeited, and even the beſt ſometimes ſet off to more advantage by mixing Dutch pink with the ochre. This impoſition muſt be guarded againſt, which may be done by heating it to the degree that will turn paper brown, which, if it be genuine, will make little or no alteration in it; but if it be adulterated in this manner, will give an apparent foulneſs to it

Of Dutch pink.

DUTCH PINK is a pigment formed of chalk, coloured with the tinging particles of French berries, or other vegetables. It is principally uſed for coarſer purpoſes in water, not bearing well to be worked in oil, nor can it be depended upon with regard to its ſtanding, ſo as to be fit for paintings of any conſequence.

There are a variety of methods of preparing Dutch pink; but the following is very cheap and eaſy, and makes a moſt beautiful pigment.

" Take of French berries one pound, and " of turmeric-root powdered four ounces; " boil them in a gallon of water two hours, " and then ſtrain off the tincture through " flannel, and boil it again with an ounce of " alum till it be evaporated to one quart. Pre" pare in the mean-time four pounds of chalk " by waſhing it over, and afterwards drying " it, and mix the chalk with the tincture by " grinding them together, and then lay out " the Dutch pink thus made to dry on " boards."

Dutch pink is ſometimes prepared in the ſame manner with ſtarch and white lead.

The goodneſs of Dutch pink conſiſts in its being of a full gold coloured yellow and very bright. It admits of no adulteration but what would appear by the diminution of the brightneſs, and therefore the eye can determine.

Of Engliſh pink.

ENGLISH PINK is only a lighter and coarſer kind of Dutch pink, and may be prepared in the ſame manner, the quantity of chalk being increaſed in proportion, as it is intended to be inferior to the Dutch.

Of light pink.

LIGHT PINK is of two kinds, the one the ſame with the Dutch pink, only with greatly leſs colour; the other the ſame with the brown pink, that is, tranſparent in oil, but with leſs colour.

The firſt kind, like the Dutch pink, is only fit for uſing in water, and there likewiſe only in paintings where the holding of the colour is not of great conſequence.

The other is by ſome uſed in oil paintings, in the ſame manner as brown pink, its tranſparency making it have a good effect in ſhades for ſome purpoſes; but it is not a judicious practice, for all theſe colours formed of vegetables are very uncertain with reſpect to their ſtanding, and the native earths, or prepared ochres, properly managed, will anſwer equally the ſame ends.

The preparation of the firſt kind of light pink may be in the ſame manner as that of the Dutch pink, only diminiſhing the proportion of the French berries and turmeric to one half.

The other kind of light pink may be prepared in the following manner.

" Take of French berries one pound, boil " them with a gallon of water for an hour;

" and, having ſtrained off the fluid, add to it " two pounds of pearl-aſhes, diſſolved and pu- " rified by filtering through paper. Precipitate " with alum diſſolved in water, by adding the " ſolution gradually, ſo long as any ebullition " ſhall appear to be raiſed in the mixture. " When the ſediment has thoroughly ſubſided, " pour off the water from it, and waſh it " with ſeveral renewed quantities of water, " proceeding as has been before directed in " the caſe of lake, &c. Drain off the remain- " ing fluid in a filter with a paper covered " with a linen cloth; and, laſtly, dry it on " boards in ſmall ſquare pieces."

Light pink may be likewiſe prepared from fuſtic wood, weld, and ſeveral other vegetable ſubſtances, which afford copiouſly a yellow tinge.

The goodneſs of light pink lies principally in its brightneſs and tranſparency; and, when deſigned for the ſhops, care ſhould be taken that it do not fatten in the oil, which will happen if the ſalts be not thoroughly waſhed out of it.

Gamboge.

GAMBOGE is a gum brought from the Eaſt-Indies. It diſſolves in water to a milky conſiſtence, and is then a bright light yellow. It is uſed only in water, but there it is of great ſervice, being the principal, or, indeed, almoſt the only yellow commonly employed.

Gamboge requires no preparation, but diſſolves immediately on rubbing it, with the addition of water.

The goodneſs of gamboge may be diſtinguiſhed by its appearance, while in the ſtate of a gum, of a deep warm bright colour, and the more it approaches to tranſparency the better.

Of maſticot.

MASTICOT, as a pigment for painting, (for the wood is likewiſe uſed for a white glazing for earthen ware) is flake white, or white lead gently calcined, by which it is changed to a yellow of lighter or deeper teint, according to the degree of calcination. It is not greatly uſed at preſent, the colour not being very bright; but as it will ſtand perfectly in oil and in water, as well as flake white, or white lead, it certainly might be uſed for many purpoſes, as it works with the pencil better than moſt other pigments.

It may be prepared by putting the flake white, or white lead, on an earthen or ſtone diſh before a ſtrong fire, and continuing it there till the colour be ſufficiently yellow, each ſide of the plate being put next to the fire in its turn, that the whole of the maſticot may be equally calcined. Otherwiſe the matter to be calcined may be put into a crucible, and the crucible placed in a moderate heat in a common fire; care being taken to remove it as ſoon as the maſticot appears of a proper colour, which muſt be diſtinguiſhed by taking a part of it out; for the colour does not ſhew itſelf properly while the matter is hot. The calcination being finiſhed, the parts which are of the teint wanted muſt be picked out from the reſt, and put together. For, with the greateſt care, it is difficult to calcine the whole equally; and conſequently to avoid rendering ſome parts of a deep yellow or orange.

There is no further preparation neceſſary for the uſing maſticot either in oil or water painting, except the grinding it with the vehicle.

Common orpiment.

COMMON ORPIMENT is a foſſil body, compoſed of arſenic and ſulphur, with a mixture frequently of lead, and ſometimes other metals. It was formerly uſed as a yellow in painting, but at preſent is very ſeldom employed in its unrefined ſtate, unleſs to colour the matted bottoms of chairs, or other ſuch coarſe work. When purified by ſubliming, it becomes the King's yellow, of which we have before ſpoken. It is of a pale greeniſh yellow colour, and might be uſeful for ſeveral purpoſes, if its nauſeous ſmell, and ſuppoſedly poiſonous quality, did not make the meddling with it diſagreeable, particularly in oil, where its bad ſcent is greatly increaſed. The goodneſs of orpiment conſiſts in the brightneſs and ſtrength of its colour; and the warmer, or rather the leſs inclining to green, the better it is for the purpoſes of painting.

Of gall ſtones.

GALL STONES are concretions of earthy matter and bile formed in the gall bladder, or bile duct of beaſts. It is uſed by thoſe, who know the ſecret of its excellence, in water; with which being rubbed, and treated as gamboge, it becomes a deep warm yellow, that for its brightneſs and dark ſhade, when not too thin ſpread, as well as holding its colour, is very valuable.

As the gall ſtones are not always to be procured, a factitious kind may be prepared, which will greatly anſwer the ſame purpoſe. They may be made in this manner.

"Take a quart of the bile of oxen, as freſh
" as poſſible; put it into a proper pewter
" veſſel, and ſet it to boil in *balneo mariæ*,
" having added to it a quarter of an ounce of
" clear gum arabic; evaporate the whole to
" about an eighth, and then remove it into
" a China cup or baſon of proper ſize, and
" evaporate it to dryneſs, collecting it into a maſs as it becomes of a ſtiff conſiſtence."

This may be uſed as the gall ſtones; and, being more tranſparent, will be found of very great advantage in water painting.

Terra di Sienna unburnt.

TERRA DI SIENNA, as we have ſaid before, ſpeaking of it as a red when calcined, is a native ochrous earth, brought from Italy. In its uncalcined ſtate it is a deepiſh warm yellow, and but ſlightly tranſparent either in oil or water. It is much leſs uſed uncalcined than calcined; but, nevertheleſs, as it is a deeper yellow by many degrees than any of the other ochres, and of a ſuperior brightneſs, it might be uſed with advantage, as it will ſtand equally with the beſt.

When *terra di Sienna* is uſed uncalcined, it ought to be extremely well levigated and waſhed over; otherwiſe it is apt to lie heavy in the oil, which is probably the chief reaſon why it is ſo ſeldom uſed in an uncalcined ſtate, though as much wanted for ſome purpoſes as the calcined for others.

Turpeth mineral.

TURPETH MINERAL is a preparation of mercury, by calcining it together with oil of vitriol. It is an exceſſive bright true yellow, of a great body like vermilion, and will ſtand equally well with that, and it works likewiſe with oil or water much in the ſame manner. Theſe qualities render it very valuable for many purpoſes, as it is much brighter than any other yellow uſed in oil, except King's yellow, and is free from the nauſeous ſmell of that pigment as well as cooler. This coolneſs, and its bearing to be mixed with Pruſſian blue, from whence a much finer green can be produced by it than from the King's yellow without ultramarine, give it, on the whole, greatly the preference. It has not, however, that I know of, been uſed in painting by any except thoſe to whom I have recommended it; and who, on trial, have found it to anſwer to what I have here ſaid of it.

The turpeth mineral may beſt be prepared in the following manner.

"Take of pure quickſilver, and oil of vitriol, each ſix pounds. Put them into a retort, to which, being placed in the ſand-bath, fit on a receiver, and diſtil them with a ſtrong fire while any fumes appear to riſe into the receiver, urging it at laſt with as great a heat as the furnace will bear. When the retort is again cold, remove it out of the ſand-bath; and, having broken it, take the white maſs, which will be found at the bottom of it, and break it to a groſs powder; and, having put it in a glaſs mortar, pour water on it, which will immediately convert it to a yellow colour. Let it then be thoroughly ground in this mortar, with water, and afterwards waſhed with ſeveral ſucceſſive quantities. It muſt then be thoroughly well levigated on a ſtone, and dried."

The turpeth mineral may be had from the ſhops of any chymiſts or dealers in medicines; but is not at preſent in thoſe of colourmen. As it is now to be procured, it requires a previous levigation in water before it be uſed, being for the moſt part (though faultily) levigated for the uſes of the medicine only in a very ſlight manner. The marks of goodneſs in the turpeth mineral are the brightneſs of the colour, and its fulneſs or warmth; for as it never inclines more to the red than a true yellow, the leſs it verges on the green the better it conſequently is for the purpoſes of painting.

Of the yellow waſh from the French berries.

This is a ſolution of the gum of the French berries in water. It is uſed as a waſhing colour in water painting; and as it may be made of almoſt any degree of deepneſs, and is pretty bright, it is applicable to many material purpoſes, ſince nothing can be made of the gamboge but light teints. This colour will ſtand alſo extremely well, and being more diluted or laid on thicker, will, in conſequence of its tranſparency, give a variety of ſhades.

The yellow berry waſh may be thus prepared.

" Take a pound of the French berries, and
" put to them a gallon of water, with half an
" ounce of alum; boil them an hour in the
" pewter veſſel deſcribed p. 25, and then fil-

" ter off the fluid through paper if it be de-
" ſigned for nicer purpoſes, or flannel for more
" ordinary. Put them again into the boiler,
" and evaporate the fluid till the colour appear
" of the ſtrength deſired; or part may be taken
" out while leſs ſtrong, and the reſt evapo-
" rated to a proper body."

The goodneſs of the French berries may be diſtinguiſhed by their appearing large, plump, and heavy: and if they have theſe qualities, the darker they appear, the better; but unleſs they are large and plump, the darkneſs may only ariſe from their being gathered before they are duly ripe.

Turmeric waſh.

The TURMERIC WASH is the gum of the turmeric root diſſolved in water. The qualities and uſes of it are much the ſame as the yellow berry waſh, only it is a brighter and cooler yellow; but, in order to procure a bright tincture, it muſt be diſſolved in ſpirit of wine inſtead of water. In order to which the following method may be purſued.

" Take two ounces of proof ſpirit, and add
" to it one ounce of water. Being put in a
" proper phial, add two drams of turmeric root
" in powder. Shake them well together, and
" then let them ſtand three or four days, re-
" peating the ſhaking as often as convenient,
" and a ſtrong tincture will be thus obtained."

Of tincture of ſaffron.

TINCTURE OF SAFFRON is uſed as a yellow waſh with water colours. It is made by pouring hot water on the beſt Engliſh ſaffron in a proper phial or other veſſel, which ſhould be placed for ſome time in a heat next to that which would make the water boil, and the tincture ſhould then be filtered from the dregs through a piece of linen cloth. The proportion of the ſaffron to the water muſt be regulated by the intention of having the colour deeper or paler. This tincture is a fine warm yellow, and, when very ſtrong, makes a very proper ſhade for the gamboge or other light yellows that are bright; and it will ſtand equally well with any of the vegetable tinctures.

Zedoary waſh.

The ZEDOARY WASH may be prepared by boiling an ounce of zedoary root in a quart of water, till the water appear ſufficiently tinged to make a ſtain on paper of a full yellow colour. The fluid muſt then be ſtrained through linen to free it from the dregs.

This waſh will be much ſtronger of colour than can be made of turmeric without ſpirit of wine, and it is a cooler yellow than ſaffron, though full as bright. It is valuable for many purpoſes in painting with water colours, as flowers, yellow draperies, &c. It may be ſuffered to dry in ſhells, and will again diſſolve and ſpread kindly with the addition of water.

CLASS IV. Of green colours.

Of verdigris.

VERDIGRIS is a ruſt or corroſion of copper formed by the action of ſome vegetable acid, commonly that of the ſkin and pulp of grapes remaining after they have undergone a preſſure for wine. It is brought from France and Italy hither, and uſed in moſt kinds of painting where green is required. Verdigris makes a blue green colour in paint; but is generally uſed in yellow, which, by a proper mixture, renders it a true green. It is bright, when good, but very ſoon flies when uſed in oil. When uſed in water painting, as it is diſſolved previouſly in vinegar, which changes it to another ſubſtance, it is however rendered more durable.

It is needleſs to give any proceſs for the making verdigris, becauſe it may be purchaſed much cheaper than it can be made in ſmall quantities, and therefore only the proper object of a conſiderable manufacture. Such a manufactory is eſtabliſhed lately in this country by Meſſieurs —— and Maud, who have received two premiums, on that account, of the ſociety for the encouragement of arts, &c. on the moſt ſatisfactory proof, that the verdigris produced by them was even ſuperior to the foreign, as well for the purpoſes of painting as any other uſes.

There is no preparation of it neceſſary to the uſing verdigriſe in oil or varniſh, except a ſufficient levigation; but in water painting, as is ſaid before, it muſt be diſſolved in vinegar; when in fact it ceaſes to be verdigriſe, and is, inſtead of a coroſion, a ſalt of copper; the ſame with the cryſtals of verdigriſe, we ſhall next treat of, only in a diſſolved ſtate.

Solution in vinegar is not, however, the only method by which verdigriſe may be uſed in water painting, for it will diſſolve in the juice of rue, and produces a fine full green colour equally fit for waſhing with that diſſolved in vinegar.

The goodneſs of verdigriſe may be diſtinguiſhed by the fulneſs of its blue green colour, and inclining rather towards a cryſtalline texture than the form of a powder; to which muſt be added its being free from feculencies, and ſoluble in a conſiderable proportion in boiling water.

Cryſtals of verdigriſe, called diſtilled verdigriſe.

DISTILLED VERDIGRISE is the ſalt produced by the ſolution of copper, or common verdigriſe, in vinegar. The cryſtals thus formed are of an extreme bright green colour, and in varniſh, where they ſtand perfectly well, they have a very fine effect. In oil they hold their colour well enough to anſwer many purpoſes, where colours are not required to be greatly durable; but in paintings of conſequence they cannot be depended upon, being apt to turn black with time.

The cryſtals of verdigriſe may be prepared in the following manner.

" Take of the beſt verdigriſe four ounces, " and of diſtilled vinegar two quarts. The " verdigriſe being well pounded, let them be " put into a circulating veſſel, that may be " formed of a matraſs, (which is a round " bodied glaſs with a long ſtraight neck) and a " Florence flaſk, which muſt have its neck " inverted into the matraſs, the thick end being broken off. This circulating veſſel muſt " be placed in a gentle ſand-heat, or other " warm ſituation, where it muſt continue, " being frequently ſhaken, till the vinegar has " diſſolved as much as it can of the verdigriſe. Remove the verdigriſe and vinegar " then into a proper glaſs for decanting the " fluid, when it ſhall become clear, from " the ſediment; and when it has ſtood a due " time to ſettle, let it be carefully poured off " and evaporated to about half a pint, which " may be beſt done with a ſand-heat, in a " glaſs body or cucurbit, having its neck " cut off to a wide mouth. It may be ſet " to ſhoot in the ſame veſſel, or in a glaſs " receiver with a wide neck; and, when " the cryſtals are formed, they muſt be " taken out, and carefully dried in the " ſhade.

" A

"A freſh proportion of vinegar may be
" added to the remains of the verdigriſe,
" and at the ſame time the firſt quantity left
" undiſſolved; and the mothers, or fluid re-
" maining after the cryſtals were formed,
" may be put into it; by which means, the
" other parts of the proceſs being repeated, a
" ſecond quantity of the cryſtals will be ob-
" tained."

The diſtilled vinegar produces the moſt beautiful cryſtals of verdigriſe; but common vinegar is more frequently uſed by thoſe who prepare them, as it is much cheaper, and will afford very good coloured cryſtals, if care be taken in the evaporation not to ſuffer any part of it to burn to the glaſs; to avoid which accident, it is proper that the veſſel wherein the evaporation is made ſhould not be ſunk deep in the ſand, but only ſet upon it, or ſurrounded a little above the bottom.

The goodneſs of the diſtilled verdigriſe may be perceived by the clearneſs of the cryſtals, and the bright green colour of them when powdered; for, being ſaline cryſtals, they do not admit of any ſophiſtication, and can be only faulty through impurity.

Of ſap green.

Sap green is the concreted juice of the buckthorn-berries expreſſed from them.

It is a yellow green, and only uſed in water painting, where it is very uſeful for ſome purpoſes as a waſhing colour, making a ſtrong and pretty bright ſtain. Sap green may be prepared in the following manner.

"Take any quantity of buckthorn-berries "before they be ripe, and preſs out the juice "in ſuch a preſs as is uſed for making cyder "or verjuice, or by any other method. "Strain this juice through flannel, and then "let it ſtand to ſettle; and, when it has "ſtood a proper time, decant off the clearer "part of the fluid from the ſediment. Put "this juice into a ſtone or earthen veſſel, and "evaporate it till it begins to grow of a thick "conſiſtence; then remove it into the pewter "veſſel deſcribed p. 25, and finiſh the evaporation in *balneo mariæ*, collecting the "matter into one maſs as it acquires a proper "conſiſtence."

The marks of goodneſs in ſap green are the tranſparency, brightneſs, and ſtrength of colour it appears to have when rubbed on paper.

Pruſſian green.

PRUSSIAN GREEN is the ſame with the Pruſſian blue, except that, in the preparation, the precipitated ochre of the vitriol is ſuffered to remain with the precipitated earth of alum and the ſulphur of the coal; the addition of the ſpirit of ſalt, by which, in the regular proceſs for the Pruſſian blue, the ochre is rediſſolved, being omitted; whence, this ochre being yellow, a green is produced by it through the effect of the blue of the ſulphur. The qualities of the Pruſſian green are much the ſame with thoſe of the blue, except the difference of colour, and that it is not ſo tranſparent, nor, with regard to any I have hitherto ſeen, ſo bright; neither can it be ſo well depended upon for ſtanding as the Pruſſian blue when rightly prepared, though it is nearly equal in that point to the common. As the qualities are ſo much the ſame, the uſes to which the Pruſſian green may be applied are much the ſame with thoſe of the blue, excepting difference of hue; and at one time this colour was gaining ground among painters of ſome kinds; but it has ſince then been neglected, and at preſent ſeems almoſt wholly laid aſide, though I am not ſenſible of the reaſon why this pigment might not be of advantage in many kinds of painting, as well as the common Pruſſian blue.

The manner of preparing this pigment may be as follows.

"Proceed in all points as in the proceſs
"given for the Pruſſian blue, till the ſolu-
"tion of alum and vitriol be mixed with
"that of the pearl-aſhes and ſulphur of the
"coal, and the green precipitation made.
"Then, inſtead of adding the ſpirit of ſalt,
"omit any further mixture, and go on to
"waſh the ſediment, which is the Pruſſian
"green,

" green, and afterwards to dry it in the ſame " manner as is directed for the blue."

The goodneſs of the Pruſſian green conſiſts in the deepneſs and brightneſs of the colour, and the more it is of a true teint of green, the better it is.

Terra verte.

TERRA VERTE is a native earth, which in all probability is coloured by copper. It is of a blue green colour, much of that teint which is called *ſea-green.* What we have in common here is not very bright, but being ſemi-tranſparent in oil, and of a ſtrong body in water, and ſtanding equally well with the beſt pigments, it is very much adapted to anſwer ſome purpoſes in both kinds of painting, though it is not ſo generally uſed by thoſe to whom it would be ſerviceable as it merits. Mr. d'Acoſta ſays, in his book of foſſils, that there is a kind which is very bright, and is found in Hungary; if it could be procured here, it would certainly be a very valuable acquiſition to oil painting, as the greens we are forced at preſent to compound from blue and yellow are ſeldom ſecure from flying or changing.

Terra verte, as brought from abroad, is of a very coarſe texture, and requires to be well levigated and waſhed over; but no other preparation is neceſſarily previous to its uſe. The only method of diſtinguiſhing its goodneſs

neſs is by the brightneſs and ſtrength of its colour.

CLASS V. Of orange colours.

THERE is not any ſimple pigment, prepared commonly, which can properly come into this claſs, the effect of orange being produced in practice by the mixture of red and yellow; but the following preparation being of my own invention, and ſerviceable to ſome who have already made a conſiderable uſe of it, I thought it proper to inſert it for the benefit of others who may want ſuch a pigment.

Of orange lake.

This ORANGE LAKE is the tinging part of annatto precipitated together with earth of alum. It is of a very bright orange colour, and would work well with either oil or water; but cannot be depended upon, when uſed either of thoſe ways, for ſtanding long. It is, however, a very fine colour for varniſh painting, where the fear of flying is out of queſtion; and is alſo of an admirable good effect for putting under cryſtal for the imitation of the vinegar garnet, for which purpoſe it has been uſed with great ſucceſs.

The manner of the preparation of the orange lake may be as follows.

" Take of the beſt annatto four ounces, " and of pearl-aſhes one pound; put them

“ together into a gallon of water, and boil “ them half an hour, and then ſtrain the ſo- “ lution through paper. Make, in the mean- “ time, a ſolution of a pound and an half of “ alum in another gallon of water, and mix “ it gradually with the ſolution of the pearl- “ aſhes and annatto, obſerving to ceaſe any “ further addition when the fluid becomes “ colourleſs, and no further ebullition enſues “ on the commixture. Treat the ſediment “ or precipitated matter then in the ſame man- “ ner as has been before directed for other “ kinds of lake, only this need not be formed “ into drops, but may be dried in ſquare bits, “ or round lozenges.”

CLASS VI. Of purple colours.

Of the true Indian red.

THE TRUE INDIAN RED is a native ochrous earth of a purple colour; and before the cheapneſs of the factitious kind occaſioned it to be rejected by the colourmen, and conſequently diſuſed by painters, was conſtantly brought from the Eaſt-Indies and ſold in the ſhops. At preſent it is very rarely to be found; but when it can be met with, it is certainly very valuable (there being no other uncompounded purple colour in uſe with oil) as well for the force of its effect as for the certainty of its ſtanding. But the common kind, now falaciouſly called by its name, has been, by degrees, from accommodating it to the purpoſes of houſe-painters, made to vary from it, till it is become intirely a different colour, being a broken orange inſtead of a purple.

The true Indian red, when it can be procured, needs no other preparation than grinding or waſhing over. It may eaſily be diſtinguiſhed from any factitious kind by its being more bright than any other ochre which can be made ſo purple; and if it be rendered artificially purple by any addition, the fire will ſoon betray it, into which the genuine may be put without any hazard of change.

Of archal, or orchal.

ARCHAL is a purple tincture procured from a kind of moſs, bearing the ſame name, by ſolution in ſpirit of urine diſtilled with lime. It may be made in ſmall quantities by thoſe who cannot procure it of the manufacturers by this eaſy proceſs.

" Take an ounce of the archal weed or moſs,
" as it is ſold at the dry ſalters, and having
" bruiſed it well, put it into a glaſs phial with
" half a pint of weak ſpirit of ſal ammoniacus
" diſtilled with lime. Stop the phial cloſe,
" and leave the archal to infuſe till a ſtrong
" bluiſh purple tincture be formed."

It is an extreme bright purple fluid, and would be a beautiful waſh if it could be depended upon; but it is apt to dry to a reddiſh brown colour, and therefore at preſent much diſuſed in painting, though it had formerly a place in the common ſet of water colours. It is uſed in great quantities for ſome purpoſes of dying, and prepared by people who make it their buſineſs, and may be had cheap of them, or the dry-ſalters; but is ſcarcely worth the trouble of procuring for the ends of painting.

Of the logwood waſh.

LODWOOD is brought from America, and affords a ſtrong purple tincture in water, which will ſtain of a bluiſh purple colour almoſt any body whatever capable of receiving ſuch tinge. It is uſed frequently in miniature painting to make a purple waſh, which is varied to a more red or blue colour by the addition or omiſſion of Braſil wood. This waſh may be prepared in the following manner.

" Take an ounce of ground logwood, and " boil it in a pint of water till one half of the " fluid be waſted. Strain it then through " flannel while of a boiling heat, and add to " it, when ſtrained, about ten grains of pearl-" aſhes, or about the bulk of a ſmall French " bean. If it be deſired to be a more red " purple, about half an ounce of Braſil wood " may be added to the logwood, or in pro-" portion as the colour wanted may require; " and in this caſe the pearl-aſhes muſt be " uſed very ſparingly, or not added at all, " unleſs the tincture appear too red."

CLASS

CLASS VII. Of brown colours.

Of brown pink.

BROWN PINK is the tinging part of ſome vegetable of a yellow or orange colour, precipitated upon the earth of alum, cuttle-fiſh-bone, or ſome ſuch-like calcarious ſubſtance. It is, when good, a concentrate yellow, which, as a pigment, is tranſparent in oil, gives the effect of a dark colour, and ſerves for deep ſhades. It is ſometimes prepared of a warmer, and ſometimes of a cooler teint; and as each ſort ſuits the purpoſes of particular kinds of painters, each kind is preferred by ſome, according to their wants. Brown pink would be of great value in painting, if it could be depended upon with regard to its ſtanding; and it was formerly, when all the colours of this kind were more honeſtly and judiciouſly prepared, in almoſt general uſe in this part of the world. But at preſent it is difficult to find any that does not fly, or has not ſome other bad quality, particularly that of fattening to an exceſſive degree: and therefore it is much diſuſed, and will probably, in a ſhort time, be intirely exploded from practice.

There are many methods of preparing brown pink, as there are a great variety of vegetables which afford a yellow tinge very copiouſly, and which, treated in the ſame manner as is practiſed for making lakes, will afford ſuch a pigment; but the moſt common, and one of the beſt methods, is as follows.

"Take of the French berries one pound, "of fuſtic wood in chips half a pound, and "of pearl-aſhes one pound. Boil them in "the tin boiler, with a gallon and a half of "water, for an hour, and then ſtrain off the "tincture through flannel while the fluid is "boiling hot. Having prepared in the meantime "a ſolution of a pound and a half of "alum, put it gradually to the tincture ſo long "as an ebullition ſhall appear. Proceed then "to waſh the ſediment as in the manner directed "for the lakes; and, being brought by "filtering through paper with a linen cloth to "a proper conſiſtence, dry it on boards in "ſquare pieces."

Brown pink may be made of the cuttle-fiſh bone diſſolved in *aqua fortis*, in the manner deſcribed, p. 61, for lake; and in that caſe the precipitation may be made with this ſolution inſtead of the ſolution of alum, by adding it to the tincture ſo long as it appears to make any ebullition on the mixture. The ſolutions of the alum and cuttle-fiſh bones may be otherwiſe mixt together, and uſed for the ſame end, which will be found much better than that of the cuttle-fiſh bone alone. For though the common opinion is, that lake or brown pink will ſtand better, when the baſis is cuttle-fiſh bone, than when it is earth of alum, yet the earth of alum is neceſſary for attracting

ing and bearing down with it the tinging matter; which, eſpecially that of the French berries, is apt to remain diſſolved in the fluid, and to be carried off with it in waſhing the brown pink.

Brown pink is alſo made without the uſe of ſalts in the following manner.

“Take two pounds of the berries, and boil them in a gallon of water for two hours, and then ſtrain of the tincture carefully through flannel. Prepare in the mean-time a pound and a half of cuttle-fiſh bone, by ſeparating the ſoft inner part, which is capable of being reduced to powder, from the hard exterior part, that muſt be thrown away, and levigating it well with water on a marble. Add then the cuttle-fiſh bone to the tincture, and evaporate them in *balneo mariæ* till the matter becomes of a ſtiff conſiſtence; when the whole being well mixt by grinding, it may be laid on boards to dry.”

The goodneſs of brown pink muſt be judg-d by its tranſparency and force of colour hen mixed with oil; but its qualities of ſtanding well, and not fattening in oil, which are oth defects that frequently attend it, can only e aſcertained by trial and experience.

Of biſtre.

BISTRE is the burnt oil extracted from the ot of wood. It is a brown tranſparent colour,

lour, having much the ſame effect in water painting, where alone it is uſed; as brown pink in oil. Though this colour is extremely ſerviceable in water colours, and much valued by thoſe who know and can procure it, yet it is not in general uſe here, on account, I imagine, of its being not eaſily had of a perfect kind; for I have never heard of any that was good, except what has been brought from France. Perhaps the principal reaſon for this is, that dry beech-wood affords the beſt ſoot for making it; and it is not eaſy to procure ſuch here without mixture of the ſoot of green wood, or other combuſtibles that deprave it for this purpoſe; or, it is poſſible, that they who have pretended to prepare it have been ignorant of the proper means, there not being any recipe or direction in books that treat of theſe matters, from whence they could learn them.

Biſtre may, however, be prepared with great eaſe in the following manner.

"Take any quantity of ſoot of dry wood; "but let it be of beech wherever that can be "procured; put it into water in the propor- "tion of two pounds to a gallon, and boil "them half an hour. Then, after the fluid "has ſtood ſome little time to ſettle, but while "yet hot, pour off the clearer part from the "earthy ſediment at the bottom; and if on "ſtanding longer it form another earthy ſe- "diment, repeat the ſame method; but this "ſhould be done only while the fluid remains "hot. Evaporate then the fluid to dryneſs, "and what remains will be good biſtre, if the "ſoot was of a proper kind."

The goodneſs of biſtre may be perceived by its warm deep brown colour, and tranſparency when moiſtened with water.

Of brown ochre.

BROWN OCHRE is a foſſil earth, the ſame with the other ochres, except with regard to purity and the teint of its colour, which depends on calcination, either by ſubterranean fires or artificially. It is of a warm brown or foul orange colour; and, as it can be abſolutely depended upon for ſtanding, it is valued by ſome in nicer kinds of painting, but moſt uſed, being of very low price, for coarſer purpoſes.

When brown ochre is uſed for more delicate kinds of painting, it ought to be well levigated after it comes out of the hands of the colourmen, if had of them in the groſs ſtate in which it is commonly ſold. But whoever would have it in the moſt perfect condition, muſt waſh it over, which treatment ſhould indeed be beſtowed on all pigments of an earthy texture.

Cologn, or Collen's earth.

COLOGN EARTH is a foſſil ſubſtance. It is of a dark blackiſh brown colour, a little inclining towards purple. The principle uſe of it in painting is as a water colour, and its greateſt effect is in the fore grounds of pictures, where great force is required. It is not, however, at preſent much uſed even as a water colour, and more rarely in oil, as there the ſame teint can be eaſily formed of blue, black, and any of the ochrous reds, which are pigments abſolutely ſafe with reſpect to ſtanding.

The goodneſs of Cologn earth muſt be judged of by the ſtrength of the colour, and the ſuitableneſs of the teint to the purpoſes for which it is uſed. It requires no other preparation than to be ground perfectly fine with water.

Terra Japonica, or Japan earth.

TERRA JAPONICA is a gummous ſubſtance extracted from ſome kind of vegetable. It diſſolves to a great degree in water, and is of a full brown colour, a little inclining to red. It is ſometimes uſed as in water painting; and as it is there a waſhing colour, may have a very good effect in many caſes. In oil, its gummy texture renders its uſe improper, as it does not admit of its mixing kindly with that vehicle.

The goodneſs of *terra Japonica* may be diſtinguiſhed by the clearneſs of its colour, and its appearing free from heterogeneous matter or impurities.

It requires no preparation, but it is diſſolved in water, and freed from any feculencies.

Of umbre.

UMBRE is an ochrous earth of a brown colour. It was formerly uſed in moſt kinds of painting, but is at preſent neglected, except by ſome in water colours. It is valuable on account of its property of ſtanding well, which it has in common with moſt other native earths, and it is ſuppoſed to have a more drying quality than other ochres, which has occaſioned it to be much uſed in the making drying oils, the japanners gold ſize, and the black oil lacker.

The umbre is frequently burnt previous to its being uſed, which renders it more eaſy to be levigated; but it gives it at the ſame time a redder hue. Whether it be uſed in a burnt or unburnt ſtate, it is neceſſary, however, to waſh it over when it is uſed in miniature painting, or for any nicer purpoſes, and that is all the preparation it requires.

Of aſphaltum.

ASPHALTUM is a bituminous matter of a conſiſtence like tar, found in the earth in ſome parts of Aſia, and probably elſewhere. It has a warm brown colour, and retaining in ſome degree its tranſparency when dry, it anſwers the end of brown pink in oil painting, with the additional advantage of being ſecure from flying. It is not in general uſe, nor probably eaſily to be procured poor; but it is certainly uſeful, when to be obtained good. The only objection I have ever heard to it is, that it turns ſometimes blackiſh; but I never ſaw an inſtance of that, though I have known it uſed by ſeveral; and believe that appearance is not owing to any change in its colour, but to that denſity of its ſubſtance which it contracts in drying, and which ſhould be allowed for in the application of it.

There is no preparation neceſſary to aſphaltum previous to its uſe, but it ought to be carefully preſerved in a propher phial with a wide neck, otherwiſe it is ſubject to dry, and become too thick for the purpoſes of painting.

Aſphaltum is very liable to be adulterated by the mixture of turpentine, pitch, and other cheap ſubſtances of a balſamic conſiſtence, with it: and it is not eaſy to diſtinguiſh the fraud, but by the appearance. When the aſphaltum is good, it ought to be perfectly tranſparent, but of a warm deep brown colour.

Of the Spaniſh juice, or the extract of liquorice.

The SPANISH JUICE is the ſucculent part of the liquorice-root, extracted by decoction in water, and then ſtrained off from the woody or undiſſolvable part of the root, and evaporated to dryneſs. It is ſometimes prepared in this country, but moſtly brought from abroad, and is now much uſed as a brown colour in miniature painting, from its requiring no trouble to procure it, or render it fit for immediate uſe, and from the ſcarcity of good biſtre. The latter, nevertheleſs, when it is to be had, is greatly preferable to the Spaniſh juice, as well on account of the clearneſs of its colour, as from its being free from that viſcid or ſticky quality which attends the other on the leaſt moiſture.

CLASS VIII. Of white colours.

Of white flake.

WHITE FLAKE is lead corroded by means of the preſſing of the grape, and conſequently, in fact, a ceruſe prepared by the acid of grapes. It is brought here from Italy, and far ſurpaſſes, both with regard to the purity of its whiteneſs, and the certainty of its ſtanding, all the ceruſe or white lead made here in common. It is uſed in oil and varniſh painting for all purpoſes where a very clean white is required; but no kind of ceruſe ought to be uſed in water colours for paintings that are intended to endure time, as it will generally turn black, and appear at length as if the lead itſelf had been uſed inſtead of any preparation of it.

White flake is uſually had of the colourmen in a prepared ſtate, under the name of *flake white*, being levigated and mixed up with ſtarch, and moſt frequently with white lead, or much worſe ſophiſtications. Whoever, therefore, would be certain of uſing this pigment pure, ſhould procure the white flake in lump as it is brought over, and levigate it themſelves, waſhing it over alſo; and, if it be neceſſary, in order to the making it work more freely, they may grind it up afterwards with ſtarch in the proportion they ſhall find on trial moſt ſuitable to their purpoſe.

The teſt of goodneſs in white flake is the degree of whiteneſs, which muſt be diſtinguiſhed by comparing it with a ſpecimen of any other parcel, after it has been rendered of due fineneſs; but where it is ſuſpected to be adulterated with any other mixture than that of white lead, the ſophiſtication and proportion of the ſpurious matter may be aſcertained by the ſame means as are below adviſed to be uſed for the examination of white lead.

White lead.

White lead, or ceruse, is the corroſion or ruſt of lead formed by means of vinegar.

It is made in our own country, and is much cheaper than white flake, but inferior in whiteneſs, and the other qualities which render this pigment advantageous in painting. It is, however, the white employed for all common purpoſes in oil painting, and alſo the body or ſolid baſis of the paint in many mixt colours, where the teint is of a lighter nature, or the coloured pigments will bear diluting with white.

It is made by dipping or bruſhing plates of lead in vinegar, or any other cheap acid, and putting them in a cellar or any cool damp place; but as this is carried on as a large manufacture by thoſe who are concerned in it, and who can conſequently afford it at a much lower rate than any can prepare it for their own uſe, it is unneceſſary to enter on a further detail with reſpect to the manner.

There is no previous preparation neceſſary in the caſe of white lead to its uſe, except waſhing over where it is intended for more delicate purpoſes; but then indeed it is always beſt to ſubſtitute the flake white.

Notwithſtanding the low price of white lead, yet, being conſumed in great quantities, it is for the moſt part adulterated by the manufacturers of, or wholeſale dealers in it. The common ſophiſtication is with chalk or powdered talc, as being the cheapeſt ingredients with which it can be mixt without changing too much its appearance. This in a leſſer degree is of no great moment, as they only diminiſh the quantity of body or covering matter in the paint; but when in a greater proportion, they not only produce a great loſs, by rendering a larger quantity neceſſary to do the ſame work, but deprave the paint highly with reſpect to its other qualities.

The adulteration of white lead may be moſt eaſily examined by comparing a piece of any that is ſuſpected with another piece, known to be pure, of equal bulk, and the difference of weight will ſhew the fraud where the heterogeneous matter is in great proportion, as it will neceſſarily be of a much lighter nature than lead. But where the quantity of the adulterating matter is leſs, or the proportion of it would be more exactly known, the following method ſhould be uſed.

"Take an ounce of the white lead ſuſ-"pected, and mix it well with about half an "ounce of pearl-aſhes, or of any fixt alka-"line ſalt, and about a quarter of an ounce "of charcoal-duſt, and, having put them into "a crucible, give them a ſtrong heat. The "lead will by this means be reduced to its "metallic ſtate, and, being weighed, will ſhew "by what it may fall ſhort of the weight of "an ounce, the proportion of the adultera-"tion, about a tenth part being allowed for "the corroding acid which formed part of "the white lead."

Of calcined, or burnt hartſhorn.

CALCINED HARTSHORN is the earth which makes the baſis of horn, or indeed all other animal ſubſtances, rendered pure by the action of fire, which ſeparate from it all ſaline and ſulphureous ſubſtances. It is of the firſt degree of whiteneſs, and not ſubject to be changed by the air or time, and is, on account of theſe qualities, almoſt the only white now uſed in water painting for nicer purpoſes, white lead or flake, from the objection before mentioned with reſpect to their turning black, being greatly diſuſed by the more experienced painters.

It is not neceſſary that this earth ſhould be produced from the horn of ſtags, for any other horn, or indeed any other animal ſubſtance of the more ſolid kind, will equally well produce it. The common manner of preparation of this matter is, to calcine, in an open furnace, the coal of the horn remaining after the diſtillation of the ſpirit of hartſhorn. But what is ſold for calcined hartſhorn at preſent is more frequently the earth of bones, and if there be no further ſophiſtication practiſed, this ſubſtitution is not in the leaſt detrimental. It is, however, I am afraid, too uſual to mix chalk or lime with the animal earth, which by their alkaline power change the colour of the vegetable pigments, and fruſtrate often the labour of the painter, without his being able to gueſs at the cauſe of his miſcarriage. Whoever is deſirous to prevent this inconvenience, and to have the burnt hartſhorn perfectly pure, may prepare it eaſily themſelves in the following manner.

“ Take horn or bones, and burn them in
“ any common fire till they become a coal,
“ or are calcined to ſome degree of whiteneſs.
“ Then, having freed them carefully from

"any other coal or filth, reduce them to a "groſs powder, and put them upon a veſſel "made in form of a common earthen diſh "of ground crucibles and Sturbridge clay well "dried, and procure this to be placed in a "tobaccopipe-maker's, or potter's furnace, "during the time they keep their pipes or pots "in the fire. The earth of the horn or bones "being thus thoroughly calcined, it muſt be "very well levigated with water, and it will "be yet further improved by being carefully "waſhed over."

The perfection of calcined hartſhorn lies in its whiteneſs and fineneſs, which may be diſtinguiſhed by the ſight and touch, and in purity alſo, which is not ſo eaſily diſcovered. It may be known, nevertheleſs, by the pouring oil of vitriol upon any ſuſpected quantity, which will not produce any ebullition with pure calcined horn or bones; but will immediately excite an apparent fermentation with lime or chalk, the common matter with which they are adulterated, if any be mixt with them.

Of pearl white.

PEARL WHITE is the powder of pearls, or the finer parts of oyſter-ſhells; but I ſuppoſe the former has rarely been uſed, on account of the dearneſs of the pearls; which are, moreover, not in the leaſt better for this purpoſe than the oyſter-ſhells properly managed.

This white is uſed in miniature paintnigs, and agrees much better with the vegetable colours than flake, white lead, or Troy white.

The method of preparing the pearl white is to take the oyſters as they are found on the ſea-coaſt calcined by the ſun, or otherwiſe to dry freſh ones by the fire till they will powder eaſily, (avoiding, however, carefully ſuch heat as may in the leaſt burn them, or change their colour;) then ſcrape off from theſe ſhells all outward or other parts that may not be of the moſt perfect whiteneſs, and levigate them well with water on the ſtone, and waſh the powder over till thoroughly fine.

Of Troy white, or Spaniſh white.

The TROY WHITE, or SPANISH WHITE, is chalk neutralized by the addition of water in which alum is diſſolved, and afterwards waſhed over.

It is uſed by ſome in water colours as a white, and may be thus prepared.

"Take a pound of chalk and ſoak it well "in water. Then waſh over all the fine part, "and, having poured off the firſt water, add "another quantity, in which two ounces of "alum is diſſolved. Let them ſtand for a day "or two, ſtirring the chalk once in ſix or eight "hours. Waſh then the chalk again over, till "it be rendered perfectly fine, and pour off "as much of the water as can be ſeparated "from the chalk by that means, taking off "the remainder of the diſſolved alum by "ſeveral renewed quantities of freſh water. "After the laſt water is poured off, put the "chalk into one of the cullender filters, with "a linen cloth over the paper, and when the "moiſture has been ſufficiently drained off "from it, lay it out in lumps to dry on a "proper board."

Of egg-ſhell white.

EGG-SHELL WHITE is uſed by ſome in water colours, and preferred to flake, or the Troy white. It may be thus prepared.

"Take egg-ſhells and peel off the inner "ſkins. Then levigate the ſhell to a proper "fineneſs, and waſh over the powder."

CLASS IX. Of black colours.

Of lamp black.

LAMP BLACK is the ſoot of oil collected as it is formed by burning. It is a browniſh black; but, nevertheleſs, being of a good texture for mixing either with oil or water, and drying well with oil, it is the principal black at preſent uſed in all nicer kinds of painting; for notwithſtanding ivory black far ſurpaſſes this in colour, the groſs and adulterate preparation of all that is now to be obtained has occaſioned it to be greatly rejected.

The lamp black is made by burning oil in a number of large lamps in a confined place, from whence no part of the fume can eſcape, and where the ſoot formed by theſe fumes, being collected againſt the top and ſides of the room, may be ſwept together and collected, and this being put into ſmall barrels is ſold for uſe without any other preparation.

The goodneſs of lamp black lies in the fulneſs of the colour, and the being free from duſt or other impurities. The lightneſs of the ſubſtance furniſhes the means of diſcovering any adulteration, if to a great degree, as the bodies with which lamp black is ſubject to be ſophiſticated are all heavier in a conſiderable proportion.

Of ivory black.

Ivory black is the coal of ivory or bone formed by giving them a great heat, all acceſs of air to them being excluded. It is, when pure, and genuinely prepared from the ivory, a full clear black, and would be the moſt uſeful of any in every kind of painting, but that it is apt to dry ſomewhat too ſlowly in oil. At preſent, nevertheleſs, it is prepared only by thoſe who manufacture it from bones in very large quantities for coarſe uſes, and ſell it at an extreme low price. It is therefore ſo groſsly levigated, being ground only in hand or horſe-mills, and ſo adulterated moreover with charcoal-duſt, which renders it of a blue caſt, that it is wholly exploded from all more delicate purpoſes, and lamp black uſed in the place of it, though inferior, with regard to the purity and clearneſs of the black colour, to this when good.

As the ivory black, notwithſtanding, has its merit in moſt kinds of painting, when its preparation is properly managed, (particularly in water and varniſh) thoſe who deſire to have it may prepare it themſelves in perfection by the following means.

" Take plates, chips, or ſhavings of ivory, " and ſoak them in hot linſeed oil, or if filings " are to be more eaſily procured, they may be " uſed moiſtened with the hot oil. Put them " into a veſſel which will bear the fire, covering them with a ſort of lid made of clay and " ſand, which ſhould be dried, and the cracks " repaired before the veſſel be put into the fire. " Procure this veſſel to be placed in a tobacco-" pipe-maker's or potter's furnace, or any " other ſuch fire, and let it remain there during one of their heats. When it ſhall be " taken out, the ivory will be burnt properly, " and muſt be afterwards thoroughly well levigated on the ſtone with water; or it ſhould " indeed, to have it perfectly good, be alſo " waſhed over."

Thoſe who have a calcining furnace, ſuch as is deſcribed p. 23, may very commodiouſly burn the ivory in it, and the fire need not be continued longer than while the fumes that ariſe from the veſſel containing the ivory appear to flame. This operation may likewiſe be performed in the ſubliming furnace deſcribed p. 16, by putting the ivory in a retort coated with the fire-lute, and fixing the retort as is directed, p. 33, for the ſublimers; and a proper receiver being fitted to the retort, the fumes will be detained in it, and the ſmell prevented from being in the leaſt troubleſome; the fire muſt in this caſe be continued while any groſs fumes come over.

The goodneſs of ivory black may be perceived by its full black colour, not inclining too much to blue, and by its fineneſs as a powder.

Of blue black.

BLUE BLACK is the coal of ſome kind of wood, or other vegetable matter, burnt in a cloſe heat where the air can have no acceſs. The beſt kind is ſaid to be made of vine-ſtalks and tendrils; but there are doubtleſs many other kinds of vegetable ſubſtances from which it may be equally well prepared. It is, when good, a fine bluiſh black colour, uſeful in moſt kinds of paintings for many purpoſes; but is rarely to be had at preſent well prepared, and therefore much neglected in moſt nicer caſes.

Thoſe who deſire to have blue black perfectly good, may prepare it in the manner above directed for the ivory black, from the vine-ſtalks or tendrils, or any other twigs of wood of an acid taſte or tough texture, but the ſoaking in oil, preſcribed for the ivory, muſt be here omitted.

The goodneſs of the blue black conſiſts in the cleanneſs and blue caſt of its black colour, and the perfectneſs of its levigation, which ſhould be managed as directed for the ivory black.

Of Indian ink.

INDIAN INK is a black pigment brought hither from China, which, on being rubbed with water, diſſolves and forms a ſubſtance reſembling ink, but of a conſiſtence extremely well adapted to the working with a pencil. On this account, it is not only much uſed as a black colour in miniature painting, but is the black now generally made uſe of for all ſmaller drawings in *chiaro obſcuro*, or where the effect is to be produced from light and ſhade only.

The preparation of Indian ink, as well as of the other compoſitions uſed by the Chineſe as paints, is not hitherto revealed on any good authority; but it appears clearly from experiments to be the coal of fiſh bones, or ſome other animal or vegetable ſubſtance, mixed with iſinglaſs ſize, or other ſize, and, moſt probably, honey or ſugar-candy to prevent its cracking. A ſubſtance, therefore, much of the ſame nature, and applicable to the ſame purpoſes, may be formed in the following manner.

"Take of iſinglaſs ſix ounces, reduce it to "a ſize, by diſſolving it over the fire in double "its weight of water. Take then of Spaniſh "liquorice one ounce, and diſſolve it alſo in "double its weight of water, and grind up "with it an ounce of ivory black, prepared "as above directed in p. 140. Add this mixture to the ſize while hot, and ſtir the "whole together till all the ingredients be "thoroughly incorporated; then evaporate away the water in *balneo mariæ*, and caſt the "remaining compoſition into leaded moulds "greaſed, or make it up in any other form."

The colour of this compoſition will be equally good with that of the Indian ink; the iſinglaſs ſize, mixt with the colours, works with the pencil equally well with the Indian ink; and the Spaniſh liquorice will both render it eaſily diſſolvable on the rubbing with water, to which the iſinglaſs alone is ſomewhat reluctant, and alſo prevent its cracking and peeling off from the ground on which it is laid.

CHAP.

CHAP. III.

Of the vehicles, dryers, and other ſubſtances uſed in painting for the laying on and binding the colours.

SECT. I. *Of the vehicles, dryers, &c. in general.*

THE qualities neceſſary in all vehicles (except in the caſe of crayons and enamel painting) are, that they ſhould be of a proper degree of fluidity to ſpread the colour,—that they ſhould be of ſuch a nature, with reſpect to their attractive diſpoſition, as fits them to combine well with the coloured pigments,—that they ſhould become dry within a due time,—and that they ſhould be capable of leaving a proper tenacious body, when they are become dry, as well to bind the colours to the ground, as to make them adhere to each other where more than one kind is uſed. But the combination of all theſe neceſſary qualities being to be found in no one ſubſtance, (except oil in ſome caſes) compoſitions have been formed to ſuit the ſeveral intentions in a manner accommodated to each particular occaſion.

The principal vehicles hitherto uſed are oils,—water,—ſpirit of wine,—and turpentine. But, as water and ſpirit of wine alone, want the proper unctuous conſiſtence for ſpreading the colours, and dry away totally, without leaving any glutinous ſubſtance to bind and fix ſuch of the pigments as are of an earthy or incohering texture, gums,—ſize,—ſugar,—and other ſuch viſcid ſubſtances have been ſuperadded to ſupply the defects, and render them of due conſiſtence and body.

Though oils, ſimply uſed, are a perfect vehicle of colours in ſome caſes, yet in many others, having been found to dry too ſlowly, means have been ſought after, by the addition of other bodies, to alter this quality in ſuch as may be defective in it, which has conſequently introduced another kind of ſubſtances into the *materia pictoria.* Theſe ſubſtances, from their being employed in the intention of remedying this fault in the oils of not drying ſufficiently faſt, are called *DRYERS.* Theſe are either ingredients of a different nature added to the oils, without any preparation of them; or part of the oils themſelves, into which this quality has been introduced by the operation of heat, either in their ſimple ſtate, or with the addition of the other drying ingredients. The oil, thus changed, being thence rendered capable, on its commixture with other oils, to cauſe them to dry faſter, is called *drying oil,* and frequently uſed in the ſame intention as other dryers.

As water in its ſimple ſtate is for the moſt part incapable of being a vehicle to colours, they being in general of an earthy or incohering texture, it is neceſſary to give it a more viſcid conſiſtence, and to join to it a body which will dry with ſuch a tenacity as may bind the colours.

There is, however, one exception to this, which is the kind of painting, called *painting in freſco.* In the performing of which, the colours are uſed in water without any addition.

Where water requires to be inſpiſſated, it is done by adding gums, ſize, ſugar, or ſuch other bodies as tend to inſpiſſate and impart to the water a more clammy and thick conſiſtence. But where the colours themſelves are bodies of a gummous nature, and will diſſolve or grow viſcid in water, as gamboge, the juice of the buckthorn-berries, or the French yellow berries, and ſuch others, further admixture in the intention of a vehicle is needleſs, and tends only to weaken the effects, or foul the colours.

The moſt uſual addition where water is uſed in nicer paintings, is the tranſparent gums, ſuch as the gum Arabic and Senegal. The principal reaſon of their preference to other bodies, which render water viſcid and glutinous, lies in their ſuffering the mixture made of them with the colours to be inſtantly reduced to a working ſtate, by the addition of freſh water at any time, though the quantity originally uſed be intirely dried. The conſequence of which property in the ſubſtances employed to inſpiſſate the water, colours ſo prepared, may be kept in a condition ready for uſe in ſhells, or other proper veſſels, to any length of time; but the gums have, nevertheleſs, a very untoward quality when mixed with moſt kinds of pigments, which is their being very liable to crack and peel off from the paper or vellum on which they are laid. To remedy this, therefore, ſugar-candy, or what is better, though ſeldomer uſed, honey is frequently added to them; and, by ſome, ſtarch, boiled flour, and other bodies of a like nature.

The painting in this kind of vehicle is called *painting in water colours*, and from its being of late moſtly confined to ſmall objects, *miniature painting*; though it was till the introduction of the uſe of oils, which is modern, the only common method of painting in any way, ſince the encauſtic and other methods of the ancients have been diſcontinued.

For groſſer paintings and purpoſes, water is rendered a proper vehicle by the admixture of ſize, which is free from that diſadvantage of cracking and peeling which attends the uſe of the gums. But then, on the other hand, it is unfit for nicer purpoſes where only a ſmall quantity of each kind of colour is required. For as the compoſition of the vehicle and colours do, in ſuch caſe, ſoon become dry, and thoſe mixt with ſize, when once dry, will not again commix with water, by rubbing with a bruſh or pencil, as thoſe compounded with the gums, it would be endleſs to employ ſize for ſuch purpoſes, as all the kinds of colours muſt be freſh ground up and prepared every time there may be occaſion to uſe them. The painting with ſize is therefore employed principally for ſcenes, and ſuch large works, where it is now called *painting in diſtemper*.

There are likewiſe particular caſes where other fluid ſubſtances may be employed advantageouſly along with the vehicles formed by water; as in the caſe of verdigriſe, where water failing to diſſolve it, vinegar, or juice of rue, as was before mentioned, ſhould be ſubſtituted in its place. But they are in fact only natural compounds of water, and of the ſubſtance as may be wanted to make the pigment diſſolve in, or commix with it.

Spirit of wine, as a vehicle for colours, is likewiſe inſufficient in the end, without being compounded with other ſubſtances, as it wants a proper thickneſs or viſcidity, either to ſuſpend the pigments, or to bind and fix them to the ground when dry. It is therefore found neceſſary to diſſolve in it ſuch gummous or reſinous bodies as ſeed or ſhell-lac, maſtic, ſandarac, or reſin; which anſwer the ſame purpoſe here as gum Arabic in water. A vehicle, however, formed from this mixture, has ſome advantages over all others, as the colours are ſo defended by the gummous or reſinous bodies that the moſt tender kinds ſtand very well, and retain their beauty to any length of time, if no violence impair them. The uſe of this kind of vehicle is called *painting in varniſh*, which art has been greatly improved and extended within theſe few years by the manufacturers at Birmingham; and will probably hereafter, when the conveniences and advantages of it are more generally known, be applied to purpoſes of greater account with reſpect to this ſpecies of painting.

It has been lately a practice with ſome eminent portrait painters to make a compound vehicle by mixing oil and varniſh together; and this likewiſe is by them called *painting in varniſh*; though it ought, I think, rather to be called *painting with varniſh*. The advantage that has principally induced them to uſe this method is the quick drying of the colours, which is the reſult of it; but time will ſhew them another yet greater advantage in it, I mean the preſervation of the colours, to which it will greatly contribute. The varniſh uſed for this purpoſe muſt be formed of oil of turpentine; but the particular compoſition we ſhall have occaſion to ſpeak of below.

SECT. II.

Of oils in general.

OILS of a nature ſuited to this purpoſe have been the moſt commodious and advantageous vehicle to colours hitherto diſcovered. Firſt, becauſe the unctuous conſiſtence of them renders their being ſpread and laid on more expedite than any other kind of vehicle. Secondly, becauſe when dry they leave a ſtrong gluten or tenacious body that holds together the colours, and defends them much more from the injuries either of the air or accidental violence than the vehicles formed of water. Several qualities are not, however, conſtantly found in the kind of oil proper for painting, which are, nevertheleſs, indiſpenſibly requiſite to the rendering them a perfect vehicle for all purpoſes. But the want of ſome of theſe can in many caſes be diſpenſed with; and one of them, we ſhall firſt mention, remedied by art in a great degree.

The principal and moſt general quality to be required in oils is their drying well; which, though it may be aſſiſted by additions, is yet to be deſired in the oil itſelf; as the effect of the pigments uſed in it are ſometimes ſuch as counteract thoſe of the ſtrongeſt dryers, and occaſion great delay and trouble from the work remaining wet for a very long time, and frequently never at all becoming dry as it ought: and, indeed, there are ſome parcels of the oils which have this vice in an irremediable degree.

The next quality in oils is the limpidneſs or approach to a colourleſs ſtate, which is likewiſe very material; for where they partake of a brown or yellow colour, ſuch brown or yellow intermixes itſelf neceſſarily with the teint of the pigments uſed in the oil, and of conſequence depraves it. But beſides the brown colour which may appear in the oil when it is uſed, a great increaſe of it is apt to ſucceed in time, if the oil be not good; and therefore this ſhould be guarded againſt as much as poſſible, where it may be of ill conſequence.

Both theſe qualities are, however, greatly remedied by keeping the oils a long time before they be uſed; and even linſeed oil, though much the moſt faulty in theſe reſpects, is greatly improved by time, and ſometimes rendered fit for almoſt any purpoſe whatever.

There are three changes that oils of the kind proper for painting are liable to ſuffer in their nature, and which affect them as vehicles that are confounded by painters under one term, viz. *fattening*; notwithſtanding theſe ſeveral changes are brought about by very different means, and relate to very different properties in the oils.

The firſt is the coagulation before ſpoken of by admixture of the oils with ſome kinds of pigments unduly prepared. This indeed is called the *fattening of the colours*; but the real change is in the oils, and the pigments are only the means of producing it. This change is generally a ſeparation of the oil into two different ſubſtances; the one a viſcid pitch body, which remains combined with the pigment; the other a thin fluid matter, which divides itſelf from the colour and thicker part. This laſt appears in very various proportions under different circumſtances, and in ſome caſes it is not found at all, where the pigment happens to be of a more earthy and alkaline nature; for then only a thick clammy ſubſtance, that can ſcarcely be ſqueezed out of the bladder, if it be put up in one, is the reſult of the fattening. This fattening not only happens when oil and pigments are mixed together, and kept for any length of time in bladders or otherwiſe; but even ſometimes after they have been ſpread or laid on the proper ground; for then, inſtead of drying, the ſeparation will enſue, and one part of the oil will run off in ſmall drops or ſtreams, while the other will remain with the colour without ſhewing the leaſt tendency to dry.

The ſecond is a change which happens in oils from long keeping, by which they grow more colourleſs, become more ready to dry, and acquire a more unctuous conſiſtence. In this caſe the oils are ſaid to become *fat*; tho' they are in a very different ſtate from that above-mentioned, which is cauſed by unſuitable pigments; for when this change does not exceed a certain degree, it is, as I before ſaid, every way a great improvement of the oils.

The third is a change produced by artificial means, from expoſing the oil a long time to the ſun and air, (of the particular manner and uſe of which we ſhall ſpeak more fully in its proper place) whereby it is freed from its groſſer and more feculent parts, and rendered colourleſs and of a more thick and leſs fluid conſiſtence than can be produced by any other treatment. But at the ſame time they are made more reluctant to dry, particularly with vermilion, lake, Pruſſian blue, brown pink, and King's yellow; and depraved by the acquiring other bad properties that diſqualify it for common uſe as a vehicle in painting. Theſe qualities, nevertheleſs, may be rendered advantageouſly ſubſervient to ſome particular purpoſes. But the nature, and even the preparation of fat oil is leſs underſtood at preſent than one could imagine it poſſible, with regard to a ſubſtance of ſo much conſequence, both to ſome kinds of painting, and ſeveral other kindred arts. Oils in this ſtate are called alſo *fat oils*, though it is a change that has not the leaſt affinity with either of the other; but, on the contrary, differs oppoſitely from both of them in ſome very eſſential circumſtances.

In ſpeaking therefore of the fattening of oils or colours, attention ſhould be had to the not confounding theſe three ſeveral kinds one with another. This can ſcarcely be avoided in ſome caſes, but by conſidering the occaſion where the term is uſed, and judging from the circumſtances which kind is meant.

Theſe are the ſeveral qualities by which oils are rendered ſuitable to, or improper for, the purpoſes of painting. When they dry quickly, are colourleſs, (eſpecially through age) and are ſomewhat fat in the ſecond of the above ſenſes of that word, they are perfect with reſpect to the wants of painters. Where they dry, though more ſlowly, they may, nevertheleſs, be improved to a tolerable ſtate by additions; and where they are diſcoloured, they may ſerve for ſome uſes; but where, as is frequently found, they will dry only in a great length of time, or not at all, they are abſolutely unfit for this application.

S E C T. III.

Of particular oils.

Of linſeed oil.

LINSEED OIL is expreſſed from the ſeed of line by thoſe who manufacture it in large quantities, and have mills turned by water for the more expeditious diſpatch of the work.

It is the principal oil uſed in all kinds of paintings; or, indeed, the only kind, except for ſome very nice purpoſes, where its brownneſs renders it unfit. The general defects of linſeed oil are this brown colour, and a tardineſs in drying; both which are in a much greater degree in ſome parcels than others. There is alſo ſometimes found ſuch, as, in conſequence of its being commixed with the oil of ſome other vegetable (accidentally growing with it) that partakes of the nature of olive oil, cannot be brought to dry by any art or means whatever.

The goodneſs of linſeed oil, therefore, conſiſts in its nearer approach to a colourleſs ſtate, and in its drying ſoon. Its ſtate, with reſpect to the firſt quality, may of courſe be diſtinguiſhed by inſpection only; but the latter can only be diſcovered by actual trial of it, for there is no particular appearance, or other perceptible mark, attending this quality.

Linſeed oil is in general uſed without any other preparation than the mixing it with the proper dryer; but the keeping it a conſiderable time before it be uſed will always be found to improve it. It is, nevertheleſs, uſed ſometimes, after it is prepared into the ſtate of drying oil, not to commix and make other unprepared parcels dry, but alone, as the ſole vehicle of the colours. The convenience of this is the ſpeedy drying of the paint ſo compoſed; but it cannot be practiſed where the beauty of the colour is of the leaſt conſequence,

quence, for the oil imparts in this caſe a very ſtrong brown to the mixture.

Of nut oil.

NUT OIL is the oil of walnuts preſſed out of the kernels by means of a ſcrew-preſs. It is uſed for the mixing with flake white, or other pigments, where the clearneſs of the colour is of great conſequence, and would be injured by the brownneſs of linſeed oil.

It is uſed without any other preparation than keeping, which is always of advantage to it, both with regard to its colour and quality of drying.

The faults of nut oil, when not good, are the being turbid and not perfectly colourleſs, and the drying too ſlowly. The firſt ſhews itſelf, but the other muſt be examined by trial. If, however, there be no adulteration in the caſe, time will generally cure it of all theſe defects.

Whoever would have nut oil perfectly good, ſhould peel off the ſkin of the kernels before they be preſſed, in the ſame manner as when they are eaten; for the ſkins contain an acrid oil of a very different nature from that of the white ſubſtance of the kernel, which is extremely ſubject to turn brown, or even black, and conſequently tinge the other when commixt with it.

Of poppy oil.

POPPY OIL is expreſſed from the ripe ſeed of poppies, in the ſame manner as nut oil from the walnuts. Its qualities and uſes, as likewiſe its defects and the remedy for them, are alſo much the ſame as thoſe of the nut oil; only when it is perfectly good, it is more clear and limpid, and will dry better than the beſt nut oil whatever.

Oil of ſpike or lavender.

OIL OF SPIKE OR LAVENDER are eſſential or diſtilled oils, obtained by diſtilling the ſpike, or any other lavender, with water. It is uſed in painting only as the vehicle for laying on the compoſition formed of the flux and colours in enamel painting; which by its fluidity it renders capable of being worked with a pencil; its volatile nature afterwards making it wholly dry away without leaving any matter that might effect the ſubſtances of the enamel, which would be otherwiſe if any but an eſſential oil were uſed.

Oil of ſpike or lavender is ſubject to be adulterated by the oil of roſemary, which, though much of the ſame nature, yet being of a leſs unctuous or thick conſiſtence, is not ſo well adapted to make the colours ſpread and work well with the pencil. This adulteration is not eaſily diſcoverable, where it cannot be diſtinguiſhed by the ſmell; and the beſt method, therefore, to be certain of the goodneſs of the oil of ſpike or lavender for this purpoſe is to make an actual trial of it.

SECT. IV.

Of particular dryers.

Of drying oil.

DRYING OIL, or other oils, is formed of linſeed oil, prepared by the means of boiling, ſometimes with the addition of other ſubſtances, and ſometimes without. The ſubſtances added to oil in this preparation are very various; there being many different recipes in the hands of different perſons, ſome of which preſcribe a leſs number of ingredients, and others almoſt every kind. Theſe ſubſtances are white vitriol, ſugar of lead, ſeed-lac, gum maſtic, gum ſandarac, gum animy, gum copal, umbre, colcothar, litharge, and red lead. But the firſt eight of theſe articles being dearer, when great quantities of drying oil are prepared for common purpoſes, they are uſually omitted, and the others, or ſome of them, only employed; and, indeed, if the linſeed oil be good, and boiled for a proper time, even alone, it will have nearly the ſame properties as if the moſt efficacious of theſe ſubſtances be added to it. I will, however, give two of the moſt approved recipes for preparing drying oil with the addition of the uſual ingredients. The one for the kind ſuppoſed proper for the more nice and delicate painting, the other for common work.

"Take of nut or poppy oil one pint, of
"gum ſandarac two ounces, of white vitriol,
"and ſugar of lead, each one ounce. Boil
"the whole till the ſolid ingredients be diſ-
"ſolved, and the mixture be of the colour of
"linſeed oil."

This oil will dry faſt, and mixed with an equal quantity of nut oil, and the proportion of oil of turpentine each perſon may find moſt convenient to uſe, will prove an excellent mixture for all purpoſes where a ſmall degree of yellow is not injurious; or, in other words, for all purpoſes but forming the pureſt white teint. It will alſo, when mixt with any other oil, render it capable of drying well without the leaſt hazard of fattening, however diſpoſed to it; and it may be therefore uſed for all nicer purpoſes where common drying oil would be injurious by the brownneſs of its colour.

Drying oil may be well prepared for coarſer work, according to the commonly-approved method, in the following manner.

"Take of linſeed oil one gallon, of litharge
"of gold or ſilver one pound, of white vi-
"triol half a pound, of ſugar of lead, gum
"Arabic, and umbre, each a quarter of a
"pound.

" pound. Boil them ſo long as the diſcolour-
" ing the oil, which is the gradual conſe-
" quence of the boiling, will permit it; for
" the oil muſt not be burnt till it approach
" too near to blackneſs."

The drying oil prepared in a ſimple manner, as by thoſe who make it for ſale, will not differ much from the above in its qualities, though it be prepared as follows.

" Take linſeed oil one gallon, red lead one
" pound and a half. Boil them ſo long as the
" colour will bear it."

This laſt may be much improved by the addition of gum ſandarac, and will then be perhaps more uſeful than the more complex and expenſive compoſition above given. Indeed a gallon of linſeed oil, in which two pounds of gum ſandarac and one pound of gum Arabic has been diſſolved, is the drying oil I would recommend for common purpoſes; and it need not be boiled near ſo high as that ſold in the ſhops. For, as the gums give it a very conſiderable body, the colours may be brought to a proper ſtate for working by a little of this with a larger proportion of ſpirit of turpentine, either with or without the addition of unprepared oil; and conſequently the proportion of brown given to the colour is leſs than where a greater quantity of the oil muſt be uſed.

The drying oil of any kind may be boiled in an earthen pipkin, or iron pot; but great care muſt be taken in the operation, if it be performed within any building, that the matter do not boil over; which, when it happens, greatly endangers the firing ſuch building. It is therefore much better, eſpecially where any larger quantities are made, to have an iron furnace that can be moved about, or to build an occaſional one of bricks; which, for this purpoſe, may be done without mortar. It need only be a cylinder of bricks, in which a frame with bars to ſupport the fuel is fixed, with a hole about eight inches above the bars for feeding the fire, and another in the higheſt part of the hollow for venting the ſmoke.

When the drying oil is taken off the fire, it may, while yet hot, be ſtrained through flannel; but if umbre, or any ingredients which will not diſſolve are added to it, it ſhould firſt ſtand to ſettle, that the clearer part may be poured off from the groſſer; and after ſtraining, if any ſediment appear, the oil ſhould be again decanted off from it, and the foul part heated and paſſed again through the flannel.

Of oil of turpentine.

OIL OF TURPENTINE is diſtilled from turpentine. It is an etherial oil which quickly exhales in the air, and if mixt with linſeed, nut, or poppy oils, in flying off carries with it the more volatile part of ſuch oils, and cauſes them to dry much ſooner than they would otherwiſe. On this account it is very generally uſed as a dryer to mix with the other oils; for which purpoſe it has greatly the advantage over drying oil, with regard to colour, as it is perfectly tranſparent and white.

It is uſed without any other preparation than mixing it, either alone or together with drying oil, with the other oils and colours; and it is not ſubject to any adulteration, except the diſſolving crude turpentine or reſin in it, which do not greatly injure it with regard to this application of it. Such adulteration may however be perceived, when in a greater proportion, by a ſlight degree of yellow colour and glutinous conſiſtence; the unſophiſticate being quite limpid, and without the leaſt tenacity. When in a leſs proportion, the adulteration may be diſcovered by evaporating part of what is ſuſpected with a very gentle heat, as a reſinous or terebinthinate ſubſtance will be left behind, if any ſuch have been mixt with the oil.

Of ſugar of lead.

SUGAR OF LEAD is a chymical preparation of lead by diſſolving it in vinegar, and reducing the ſalt formed by the combination of the lead with the acid of vinegar to a cryſtaline ſtate. But as ſugar of lead may always be had at the ſhops of chymiſts, druggiſts, and colourmen, and at a much leſs expence than it can be made in ſmall quantities, it is needleſs to give any more particular recipe for the making it for the purpoſes of painting. It is ſuppoſed to have a quality when mixt with oils of rendering them much more prone to dry, and on that account is very frequently uſed, as well in the making drying oil, as in the common uſe of the oils where it is ground up with them together with the colours. It requires no other treatment but to be well commixt with the oil with which it is uſed, and it is not ſubject to any adulteration if it be obtained in its cryſtaline form and not powdered; for there the appearance alone is ſufficient to ſhew whether it is clear from any mixture of heterogeneous matter.

It is, notwithſtanding, the general confidence which painters have in this ſubſtance as a dryer, dubious whether the uſe of it, except in the preparation of drying oil, anſwers in any material degree the end; for though it may aſſiſt the heat in producing that change in oils which renders them drying oils, yet it does not neceſſarily follow that any ſuch effect is produced by it without heat; though it is very probable that the ſuppoſition of this has been the occaſion of its being introduced into practice as a dryer that will operate on oils by barely mixing it with them.

Of white vitriol.

WHITE VITRIOL is a mineral ſubſtance found in Hungary and many other places. It is uſed in the ſame manner, and for the ſame purpoſes in painting as ſugar of lead, with which it is generally joined in practice, both in the making drying oils, and the admixture with the common oils and colours. It is not liable to be adulterated, on account of its low price; but it has not been unuſual to ſell common green vitriol or copperas calcined to whiteneſs in the place of it; and as they are very different ſubſtances, this ought to be guarded againſt. Thoſe who are acquainted with the appearance of both, may eaſily diſtinguiſh them by view. But others may make themſelves certain they are not impoſed upon in this particular, by putting a ſmall piece into the fire on a poker, or any other way; when, if the parcel in queſtion be true white vitriol, no redneſs will come upon it; but if it be the green vitriol calcined to whiteneſs, it will turn red by this greater heat, and have the appearance of Indian red, or brown ochre.

What was ſaid of the dubiouſneſs of the efficacy of ſugar of lead as a dryer, except in the preparation of drying oil, holds equally good with reſpect to white vitriol, though, from a ſtrong perſuaſion of the contrary, it is uſed very generally, and in a large proportion.

SECT. V.

Of the ſubſtances uſed for rendering water a proper vehicle for colours.

Of gum Arabic.

GUM ARABIC is a tranſparent gum brought from Africa and the Levant, that is eaſily ſoluble in water, which it renders viſcid. From theſe qualities, and the drying with a conſiderable degree of tenacity, it is the beſt ingredient for making an aqueous vehicle for colours hitherto known in Europe. When good, however, as it is apt to become perfectly dry, it is ſubject to crack and ſeparate from the cartoon or grounds on which the colour is laid with it, from whence ſome mixture becomes neceſſary to remove this defect.

The goodneſs of gum Arabic muſt be concluded from its tranſparent whiteneſs, the being perfectly dry and brittle, and free from all duſt and heterogeneous matter. Gum Senegal, which is of lower price, is frequently ſold for it; but this fraud may be eaſily guarded againſt by taking care to obſerve that it be not ſoft and clammy, which qualities are always in ſome degree found in gum Senegal.

There is no other preparation neceſſary for gum Arabic, previouſly to being uſed with the water, except powdering it, in order to its diſſolving the more eaſily; only it is proper to pick out all brown and diſcoloured pieces, or any foulneſs that may accidentally be in it.

Of gum Senegal.

GUM SENEGAL is much of the ſame nature as gum Arabic, and applicable to many of the ſame uſes; but it is apt to retain ſome proportion of moiſture, which conſequently renders it more ſoft and clammy. This property makes it, when alone, a leſs fit ingredient for a vehicle for water colours than gum Arabic; but yet, nevertheleſs, a third or fourth part of the gum Senegal, mixed with the gum Arabic, will greatly improve it. For, as the gum Senegal is too ſlow and reluctant to the drying perfectly, ſo the gum Arabic on the contrary dries in too great a degree; and a due mixture of them therefore produces the proper medium or temperament betwixt the two extremes.

The treatment of the gum Senegal, when uſed in a vehicle for water colours, muſt be in all other points the ſame as the gum Arabic.

Of ſize.

SIZE is made of leather boiled in water till it becomes of a viſcid conſiſtence.

It is a very proper ingredient for a vehicle for colours uſed in water in larger works; but its reluctance to be rediſſolved after it has been mixed with colours and is become dry, renders the employing it incommodious in miniature painting. Size is commonly prepared in great quantities by thoſe who make a trade of manufacturing it, together with glue, from all refuſe pieces of leather and ſkins of beaſts; but where it is wanting in painting for nicer purpoſes, it ſhould be prepared from the cuttings and ſhreds of the glovers in the following manner:

"Take any quantity of the ſhreds or cut-
"tings of glover's leather, and put to each
"pound a gallon of water; boil them ſix or
"eight hours, recruiting the water, ſo that it
"ſhall not diminiſh to leſs than two quarts.
"Then take it off the fire, and ſtrain the fluid
"through flannel while hot; and afterwards
"evaporate it again, till it become of the con-
"ſiſtence of a jelly when cold."

Of ſugar and ſugar-candy.

SUGAR and WHITE SUGAR-CANDY are uſed as ingredients to render water a vehicle for colours in miniature painting. The intention of them is to prevent the colours from cracking when mixed with gum Arabic; which the ſugar prevents, by hindering that perfect dryneſs and great ſhrinking which happens on the uſe of gum Arabic alone, and alſo to make the gum water work more kindly with the pencil. There is no preparation of the ſugar and ſugar-candy neceſſary before they be uſed, except powdering to make them melt the more eaſily.

Starch.

STARCH is ſometimes uſed inſtead of ſugar-candy for mixing with the colours that are uſed in ſtrong gum-water, to make them work more freely, and to prevent their cracking. It is a kind of ſecret with ſome perſons, who lay a conſiderable ſtreſs upon it.

Of iſinglaſs.

ISINGLASS is a glue formed from the cartilages of a large fiſh, which is found in the rivers that flow into the northern ſeas. It is uſed in miniature painting, in the ſame manner as the gums Arabic or Senegal, for rendering water a proper vehicle, by giving it a due viſcidity for ſpreading and binding the pigments of an earthy texture.

SECT. VI.

Of the ſubſtances uſed to render ſpirit of wine a vehicle for colours.

Of ſeed-lac.

SEED-LAC is a ſubſtance formed on the boughs of trees by ſmall flies as their nidus or habitation. It diſſolves in ſpirit of wine, and being left dry again by the evaporation of the ſpirit, re-attains its original hard and tough texture. It is therefore extremely beneficial in defending and ſecuring colours from any injuries the air or ſlight violence might do them. But the brownneſs of its colour, and its not rendering the ſpirit of wine, in which it is diſſolved, of a conſiſtence ſufficiently thick and viſcid to ſuſpend the powdered pigments when they are commixed with it, are defects which greatly deſtroy its value as an ingredient for making ſpirit of wine a proper vehicle for colours. It may, however, be improved for this purpoſe by the addition of turpentine and other ſubſtances, as we ſhall obſerve in its due place.

The goodneſs of ſeed-lac conſiſts of its approaching towards a tranſparent colourleſs ſtate, and being free from heterogeneous matter and opake parts; for as the brownneſs is its greateſt defect, the diminution of that quality conſequently inhances its value.

The preparation of ſeed-lac for mixing with the ſpirit of wine, is to pick out, or waſh from it by means of water, all the little woody or other feculent parts, and then to powder it groſsly; for if it be reduced to a fine powder the whole will run together, and cohere ſo as to hinder the ſpirit of wine from commixing with the particles and diſſolving them. Thoſe who want ſeed-lac for uſing with colours where whiteneſs or brightneſs are demanded, muſt pick out the lighteſt coloured grains, and uſe them only, reſerving the browner for coarſer purpoſes.

Of ſhell-lac.

SHELL-LAC is a ſubſtance brought hither in very thin pieces, and partaking greatly of the nature of ſeed-lac; from which, nevertheleſs, it differs ſo much in ſome properties as clearly ſhews they are not the ſame ſubſtance under a different form, as has been ſuppoſed by many. Shell-lac diſſolves in ſpirit of wine as well as ſeed-lac, but never becomes perfectly clear and tranſparent. To compenſate however for this defect, it renders the ſpirit much more viſcid, and capable of keeping the colours ſuſpended, from whence it derives a conſiderable value in this kind of painting.

The goodneſs of ſhell-lac conſiſts in its approaching to tranſparency and whiteneſs; but it is never found without a great degree of brownneſs. There is no more preparation of ſhell-lac than ſeed-lac required previouſly to its being uſed for this purpoſe with ſpirit of wine, the reducing it to groſs powder being the whole.

Of turpentine.

TURPENTINE is capable of diſſolving in ſpirit of wine and giving it a viſcid conſiſtence, on which account it is ſometimes uſed along with other bodies to render the ſpirit a fit vehicle for colours. A compoſition formed of it with maſtic, ſandarac, reſin, and in ſome caſes ſeed-lac, will ſerve for purpoſes where the painted body is not ſubject to great rubbing or any violence; but with reſpect to hardneſs and durableneſs, all ſuch compoſitions fall far ſhort of the ſolution of ſhell-lac.

Turpentine muſt be choſen by its clearneſs and purity, and requires no preparation previouſly to its being applied to this purpoſe.

Of the gums maſtic and ſandarac.

The MASTIC and SANDARAC are much of the ſame nature, and applied to the ſame purpoſes with regard to painting. They are gum reſins intirely white and tranſparent when good, and diſſolve perfectly in ſpirit of wine, on which accounts they are uſed for rendering ſpirit of wine a vehicle for colours; but they are of ſo ſoft a nature, and ſo ready to melt with a ſlight heat, that the colours laid on with them would ſully and be injured even by a gentle handling. On this account they require to be mixed with ſeed-lac; and, to inſpiſſate the mixture ſufficiently to ſuſpend the colours, ſome turpentine is alſo neceſſary.

Maſtic and ſandarac muſt be choſen for their whiteneſs and tranſparency, and require no other preparation for this uſe of them than to be well picked and powdered.

Of reſin.

RESIN is the *caput mortuum* or *reſiduum* left in the diſtillation of turpentine for extracting the oil. It is of two kinds, white and brown; the white is made when the turpentine is diſtilled with water; the brown, when no water is added to it. The white turpentine is uſed for rendering ſpirit of wine a vehicle for colours in the ſame manner as maſtic or ſandarac, with which it agrees in its qualities, except that it is yet leſs hard and more liable to ſully on handling, and the ſame preparation and treatment is required for it as for them.

CHAP. IV.

Of the manner of compounding and mixing the colours, with their proper vehicles for each kind of painting.

SECT. I. *Of the colours proper to be uſed with oils, and the manner of compounding and mixing them with the oils and dryers.*

THE colours proper to be uſed in oil for *red*, are vermilion; native cinnabar; lake; ſcarlet ochre; common Indian red; *terra di Sienna* burnt; (and mixt with white) red ochre; Spaniſh brown; Venetian red; and red lead:—for *blue*, ultramarine; Pruſſian blue; ultramarine aſhes; verditer; indigo; and ſmalt:—for *yellow*, King's yellow; Naples yellow; yellow ochre; Dutch pink; light pink; maſticot; common orpiment; *terra di Sienna* unburnt; (and mixed with white) and turpeth mineral:—for *green*, terra verte; verdigriſe; diſtilled verdigriſe; or cryſtals of verdigriſe; and Pruſſian green:—for *purple*, true Indian red:—for *brown*, burnt *terra di Sienna*; (unmixed with white) brown pink; brown ochre; umbre;

bre; and aſphaltum:—for *white*, white flake; and white lead:—for *black*, lamp black; ivory black; and blue black. Theſe are all the colours which are at preſent in uſe for oil painting in this country; and when they are perfect in their kinds, they are fully ſufficient to anſwer every purpoſe. The immediate preparation of them, and the manner of compounding them with the oils and dryers, may be managed thus.

Ochres of every kind, as alſo all the earthy and metallic bodies, in which are included ultramarine and its aſhes, ought to be well levigated by a good ſtone and muller with water, and waſhed over before they be mixed with the oils, when they are intended for more delicate purpoſes. Lake, brown pink, and Pruſſian blue, which being of a gummy or glutinous nature, would again acquire a coheſion, if levigated in water, may be ground to an impalpable powder, by adding ſpirit of wine to them inſtead of the water, in which ſtate they will then continue when they again become dry, and be much more eaſily and thoroughly commixed with the oils. Lamp black demands no preparation, nor does the aſphaltum require to be commixed with oil, but with ſpirit of turpentine to thin it, if it be of too thick a conſiſtence to work with the pencil.

In levigating lake or any of the pinks, as alſo King's yellow, Naples yellow, or verdigriſe with water or ſpirit of wine, great care muſt be taken not to uſe a knife or other iron implement,

plement, which would greatly injure the colours. Inſtead of ſuch knife, a thin piece of horn may be employed to take the colours off from the ſtone, or to ſcrape them together as they are grinding. Caution ſhould likewiſe be uſed with regard to the boards on which they are dried, and the place where they are repoſited during the drying; for the ſun or duſt will be very apt to deprave ſome of them in this ſtate, if they be not well kept out.

The pigments being thus duly prepared, may be ground with the oils, either on a ſtone or muller when they are wanted in greater quantities, or are intended to be kept; or by the palette-knife on the palette where they are immediately to be uſed. But they ſhould be perfectly mixed, or the oil will be apt to ſeparate, and the colours fail of their due brightneſs and effect. For convenience, the colours deſigned for the nicer kinds of painting, after they are ground with the oil, are put into pieces of bladders and tied into a kind of ball. In this ſtate ſuch as be perfect will continue good a long time, and the bladder being prickt and ſqueezed, the colour is forced out by ſmall quantities as is required for uſe.

For coarſer work, the colours demanded in great quantity are ground by hand or horſe-mills with the oil; and the others on a ſtone with a muller; after which they are put in pots, and there mixed with oil of turpentine and drying oil, according to the particular purpoſes to which they are employed.

Lake, Pruſſian blue, brown pink, King's yellow, and ſometimes vermilion, are apt to be backward in drying, and require therefore to be mixed with oil that is old and well diſpoſed to dry; and where brightneſs is requiſite the nut or poppy oil ſhould be uſed with oil of turpentine; but where the brightneſs is of leſs moment, old linſeed oil, with a third of drying oil, and the ſame proportion of oil of turpentine, may be ſubſtituted. The proportion, however, of theſe, and all dryers, muſt be adequated to the occaſion, as diſcretion may dictate, according to the quicker or ſlower diſpoſition of the pigments uſed, and the time that may be conveniently allowed for them to dry. Flake white ſhould be alſo uſed with nut or poppy oil only, and to theſe oils many add white vitriol and ſugar of lead, as well as the oil of turpentine, when they are to be uſed with this or other pigments that are too ſlow in drying. But the effect of thoſe ſubſtances, when uſed in this manner, is very dubious, as I have obſerved before.

SECT. II.

Of the ſeveral methods of painting in water, as diſtinguiſhed by the colours, vehicles, and grounds, required for different purpoſes.

THE methods of painting in water, required for different purpoſes, are diſtinguiſhed into three ſeveral kinds. The firſt called painting in *water colours*, and more uſually, as it is for the greateſt part confined to painting in ſmall, *miniature painting*. The ſecond is called painting in *diſtemper*, or *ſize painting*. The third is called painting in *freſco*, from its being frequently uſed for walls, alcoves, or other buildings in the open air.

The kind called painting in *water colours*, or *miniature*, having moſtly for its ſubject, portraits, flower pieces, or other delicate performances, finer colours are required, and more nice and elaborate means are uſed for rendering the water a proper vehicle; whence the choice of colours, and the peculiar preparation of the water by the addition of fit ſubſtances to render it ſuch a vehicle, give occaſion for this to be conſidered as a diſtinct method of painting.

The kind called painting in *diſtemper*, being for ſcenes, canvas-hangings, or cielings, and other coarſer work; leſs expenſive colours, and ſimpler means in the preparation of the vehicle are employed; which, therefore, conſtitutes this alſo a diſtinct method of painting.

The third, called painting in *freſco*, being on walls or other parts of buildings, where the plaiſter of the wall itſelf without any other preparation is to form the ground, a very peculiar choice of colours is neceſſary, and water alone ſuffices as a vehicle without any addition of other ſubſtances. Whence this likewiſe becomes a diſtinct method of painting.

SECT. III.

Of the colours to be uſed in the PAINTING WITH WATER COLOURS, *or in* MINIATURE; *with the manner of mixture, or compoſition of them with the proper vehicles.*

THE colours uſed in what is called *painting in water colours*, or *miniature painting*, are—for *red*, lead; carmine; lake; roſe pink; vermilion; red lead; ſcarlet ochre; common Indian red; red ochre; Venetian red; Spaniſh brown:—for *blue*, ultramarine; ultramarine aſhes; Pruſſian blue; verditer; indigo; ſmalt; blue bice; and litmus:—for *yellow*, gamboge; Naples yellow; Dutch pink; Engliſh pink; gall-ſtone; maſticot; French berry waſh; turmeric waſh; zedoary waſh; and tincture of ſaffron:—for *green*, ſap green; verdigriſe; diſtilled verdigriſe; and *terra verte*:—for *purple*, true Indian red; archal; and logwood waſh:—for *brown*, biſtre; umbre; brown ochre; Cologn earth; and *terra Japonica*:—for *white*, flake white; white lead; calcined hartſhorn; pearl white; Troy white; lake white; and egg-ſhell white:—for *black*, Indian ink; lamp black; ivory black; and blue black.

As water is a much leſs kindly ſubſtance for the ſpreading and working colours than oil, ſo there is a variety of treatment neceſſary for rendering it a proper vehicle for the different ſubſtances that are to be uſed with it. Whoever, therefore, would have a complete ſet of water colours, muſt not attempt to procure them by one general method of management, as in the caſe of oil, for all indiſcriminately; but muſt attend to the nature of each, and accommodate to it ſuch a compoſition of the water, and what elſe may be neceſſary to give it a due conſiſtence, as may beſt ſuit each kind. This reſtriction, nevertheleſs, ſhould be always obſerved, that nothing be uſed in the compoſition of water colours, however well it may make the colours work at the firſt admixture, but what will again, even though the compoſition become perfectly dry, ſo diſſolve and ſoften on the addition of a freſh quantity of water, as, by rubbing with the pencil to regain the fluid ſtate as on the firſt mixture, and to ſuffer the colour to work equally well as then. The beſt ſyſtems for the admixture of the variety of water colours hitherto given to the public, has been very defective in ſome material particulars, and the principal reaſon of it has been their confining themſelves to the uſe of gum water, and omitting that of iſinglaſs ſize. I ſhall therefore be the more explicit in the directions I ſhall give for the management of each kind; and am ſatisfied, that whoever follows what I adviſe will find themſelves under no difficulty in uſing all the variety of colours that are proper to be commixt with water. But, in order to avoid the repetition of the ſame thing in many places, it is proper firſt to ſhew the manner of preparing properly the gum water and iſinglaſs ſize. The gum water may be thus prepared:

" Take three quarters of an ounce of gum " Arabic and a quarter of an ounce of gum " Senegal; powder them, and then tie them " up in a linen rag; leaving ſo much un- " filled room in the bag as to admit its be- " ing flattened by the preſſure of the hand. " Having ſqueezed the bag till it be flat, " put it into a quart of hot water; and there " let it continue, moving it ſometimes about, " and ſtirring the water for about twenty- " four hours; the gums will then be diſ- " ſolved, and the bag muſt be taken out. " The fluid being divided into two parts, to " one half of it add a quarter of an ounce of " white ſugar-candy powdered, and keep the

" other in its pure ſtate. By this means a
" ſtrong and weak gum water, each proper
" for their particular purpoſes, will be ob-
" tained."

The following method is the moſt adviſeable for the making of iſinglaſs ſize.

" Take half an ounce of the beaten iſin-
" glaſs, and a pint and a half of water; boil
" them till the iſinglaſs be wholly diſſolved,
" and then ſtrain the fluid, while hot, through
" a linen rag; divide the ſize thus made into
" two parts, and to one of them add an equal
" meaſure of hot water; by which means a
" ſtrong and weak ſize will be likewiſe ob-
" tained."

Having thus prepared the gum water and ſize, a proper aſſortment of muſcle ſhells, or ſmall ivory diſhes, muſt be ſuited to the colours, accommodating the ſize of each to the due proportion of each kind of colour; as it is proper to mix up a much greater quantity of white biſtre, and the coarſer ſorts, than of carmine, ultramarine, and lake, which are to be ſparingly uſed, on account of their great price, and are only neceſſary for the lights, and higher touches, in the objects of the ſame colour. A very ſmooth China or Dutch tile muſt be provided, as alſo a ſmall ivory palette-knife; for though an iron one might be employed for ſome purpoſes, yet it is ſo noxious and injurious to the colours in other caſes, that the uſe of it is beſt rejected for the whole.

Vermilion, ultramarine, ultramarine aſhes, red lead, ſcarlet ochre, common Indian red, true Indian red, yellow ochre, Venetian red, brown ochre, verditer, indigo, maſticot, umbre, *terra verte*, bice, Cologn earth, white lead, calcined hartſhorn, ivory black, and blue black, having been previouſly well ground and waſhed over, muſt be mixed firſt on the tile, by means of the palette-knife, with as much of the ſtrong gum water as will bring them to the right temper to work with the pencil. Then while they are yet wet, they muſt be ſcraped from off the tile and ſpread with the finger in the ſhells intended for them, where they will be ready for uſe at all times, on moiſtening them duly with a little freſh water rubbed upon them by the finger or pencil.

Pruſſian blue, lake, and Naples yellow, if it be uſed, ſhould be firſt reduced to an impalpable powder, which may be beſt done for this purpoſe by levigation on the ſtone in ſpirit of wine. Then they, as alſo carmine, biſtre, Dutch pink, and Engliſh pink, ſhould be well mixed, by grinding on the tile or palette with the ivory knife, with as much of the weaker gum water before mentioned as will bring them to a proper conſiſtence; after which they ſhould be diſpoſed of in their proper ſhells, as was before directed for the other.

Gamboge, Indian ink, ſap green, gall-ſtone, and *terra Japonica*, as they become of a viſcid and adheſive nature when wet, require no gum water. They ſhould be only moiſtened and rubbed on the ſhells till the ſurface be incruſted with a proper quantity; which by the addition of a little water may be worked off with the pencil in the ſame manner as the other colours.

Verdigriſe, though uſed with water colours, cannot, nevertheleſs, be brought to a proper ſtate for working by means of water. The method of rendering it fit to be uſed in water colours is to powder it, and then pour on it a quantity of vinegar in the manner before directed for the making the cryſtals of verdigriſe. This vinegar, when it has diſſolved as much of the verdigriſe as it can take up, muſt be poured off free from the ſettlings or undiſſolved part of the verdigriſe, and muſt be put into a bottle to be kept for uſe. The kind of bottles the moſt fit for uſing with this, or the following ſubſtances in miniature painting, would be a ſmall ſort of ſuch as are made for ink bottles, in which the wideneſs of the neck, and the ſhallowneſs of the body, make it eaſy to dip the pencil; and the broadneſs of the bottem, proportionably to the height, prevents their being ſo liable to be thrown down as thoſe of any other form. The verdigriſe may likewiſe be prepared for miniature painting by means of the juice of rue; which, being poured on the verdigriſe after it is well powdered, will diſſolve it in the ſame manner as vinegar, and render it fit for uſe by the ſame treatment. The verdigriſe thus diſſolved becomes a truer green than when vinegar is employed, and it is much better adapted to miniature painting in this ſtate; for, as the juice of rue has not the acid quality of the vinegar, it does not, like that, change or deſtroy ſeveral of the other colours, particularly the litmus blue and archal, and is therefore greatly preferable; for, indeed, the ſolution of verdigriſe, though a very good green waſh, is not to be uſed with a variety of other colours without great care; and for this reaſon ſap green for the moſt part is choſen to ſupply its place.

The litmus blue muſt likewiſe undergo a preparation by other means than the addition of water before it be fit to be uſed in miniature painting; the moſt approved method of which is as follows.

"Take an ounce of litmus, and boil it in
"ſmall beer wort till their remain only about
"one fourth of the fluid. Strain it then,
"while boiling hot, through flannel; and
"when it is cold, being then of a glutinous
"conſiſtence, add as much warm water to it
"as will bring it to due fluidity for working.
"This muſt be uſed in the ſame kind of bottle
"as the verdigriſe."

Archal, the yellow berry waſh, and turmeric waſh, logwood waſh, and tincture of ſaffron, need no other preparation than has been before mentioned in their original production; but they muſt be put in the ſame bottles, and uſed as the ſolution of verdigriſe and litmus blue.

Gamboge, Indian ink, ſap green, gall-ſtone, and *terra Japonica*, as they really diſſolve and become tranſparent in water, are true waſhing colours, as are alſo thoſe laſt mentioned, which are to be in a fluid form. But neither the verdigriſe, litmus, or the yellow waſhes, are ſafely to be uſed for glazing over other colours, as they are either liable to ſuffer themſelves by ſuch treatment, or to do injury to thoſe they are laid upon.

Carmine, ultramarine, and biſtre, are alſo uſed as waſhing colours, as they will have an effect of that nature when ſpread very thin; but they are not, nevertheleſs, properly ſpeaking, waſhing colours, as they are in fact opake.

As the producing this effect of waſhing is of great uſe, as well in miniature painting as in the colouring of prints and maps, I will here impart a method by which the end may be compaſſed in a very ſerviceable degree, even in the caſe of vermilion, red lead, Pruſſian blue, lake, or even the moſt opake colours. This is to be done by mixing the pigments I have before directed to be compounded with the ſtrongeſt gum waters, with the ſtrongeſt kind of iſinglaſs ſize above-mentioned, and to ſubſtitute likewiſe the weakeſt ſize in the place of the weaker gum water, for the colours where that is ordered. So prepared, the heavier colours will work and ſpread as well as carmine, biſtre, or any other ſubſtances, except thoſe wholly fluid; and may be uſed with great convenience and advantage, not only where waſhing colours are wanted, but likewiſe for ſhading, touching, and finiſhing, or any of thoſe purpoſes where the free working of the colours is particularly requiſite in miniature painting. In the Pruſſian blue, lake, &c. it is proper, however, in order to prevent their cracking, to add ſugar-candy or honey to the ſize, in the proportion of half the weight of the iſinglaſs; in which caſe they will be found to work more commodiouſly in this vehicle than any other formed of water. Of which advantage the Chineſe are ſo ſenſible, that all their other compoſitions for uſing colours in water ſeem to be of this kind, as well as that moſt uſeful one called *Indian ink.*

SECT. IV.

Of the colours fit to be uſed in diſtemper, or painting with ſize; and the manner of mixing or compounding them with the proper vehicles.

BY *diſtemper* is meant all paintings on ſcenes, hangings of rooms, or other parts of buildings, where ſize is uſed. The ſame colours which are employed in miniature painting may be uſed in this kind with ſize. Only this method being principally confined to ſcenes and groſſer ſorts of work, where the effect depends more on the perſpective art and the oppoſition of the colours than on their brightneſs, the dearer kinds are wholly omitted, or ſparingly uſed.

The beſt method of compounding the colours with the vehicles, is to mix the ſize in water; then to levigate the colours in part of it, and afterwards to put each kind in a proper pot, adding as much more of the melted ſize as will bring it to a due conſiſtence for working, and mixing the whole well together in the pot with a proper bruſh, or wooden ſpatula. If the quantity of water originally put to the ſize do not render it ſufficiently fluid for grinding the colours, the fault may be eaſily remedied by adding warm water to it; and the ſame may be done likewiſe, if, after the mixture of colours, the whole be found too ſtiff for working.

The compoſitions of the colours and ſize muſt be prevented from drying, by tying bladders over the pots, or ſome other ſuch means; for when once they are grown dry, they cannot be brought again to a working ſtate without difficulty and trouble.

Though the grounds, the laying in, and groſſer parts of this kind of painting, be done by this mixture of the colours with ſize, yet in higher finiſhed works that require the finer colours, the more delicate parts may be beſt executed by uſing the gum waters or iſinglaſs, as above directed in miniature painting. By this means the mixing up greater quantities of the dear colours may be avoided, though otherwiſe neceſſary, as it is impracticable to keep minute quantities from drying, which, in the ſize, renders them unfit for working till they are again reduced to proper condition by means of heat; but in the others is not attended with the leaſt inconvenience.

SECT.

SECT. V.

Of the colours proper to be uſed in freſco painting, and the mixture of them with the water.

THE colours uſed in freſco paintings may be all ſuch as will ſtand the air without flying, and bear the contact of wet lime without changing. Theſe qualities are ſcarcely to be found in thoſe formed of the parts of vegetables, and therefore mineral and foſſil bodies ſhould be employed. With this reſtriction, any of the colours before mentioned, either as proper in oil or water may be admitted, but more eſpecially thoſe which derive their colour from nature.

The method of compounding the colours for this kind of painting with the water, is by ſimply mixing them with the water after being previouſly well levigated, obſerving ſuch proportion as will render them moſt agreeable to the pencil.

SECT. VI.

Of the colours proper to be uſed in varniſh painting, and the manner of mixing and compounding them with the proper vehicles.

IN painting in varniſh, all pigments or ſolid colours whatever may be uſed, and the peculiar diſadvantages which attend ſeveral kinds, with reſpect to oil or water, ceaſe with regard to this ſort of vehicle; for they are ſecured by it, when properly managed, from the leaſt hazard of changing or flying, and will all work well, provided they be previouſly reduced to the ſtate of an impalpable powder.

The preparation of colours for this uſe conſiſts therefore in bringing them to a due ſtate of fineneſs. This may be beſt done by grinding on the ſtone ſuch as are of a cohering texture, as lake, Pruſſian blue, indigo, verdigriſe, and diſtilled verdigriſe, in ſpirit of wine, or oil of turpentine; which laſt I think the better of the two for this uſe. But all the ochres, or other earthy ſubſtances, together with vermilion, red lead, and turpeth mineral, require only to be previouſly well waſhed over; and carmine, ultramarine, and King's yellow, are neceſſarily in due ſtate when well prepared in their original manufacture.

The beſt compoſition of varniſh for ſpreading and penciling the colours, with reſpect to the convenience of working, and the binding and preſerving of them, is ſhell-lac with ſpirit of wine. This, when judiciouſly managed, gives ſuch a firmneſs and hardneſs to the work, that, if it be afterwards further ſecured with a moderately thick coat of ſeed-lac varniſh, it will be almoſt as hard and durable as glaſs, and will bear any rubbing, or wear, or even ſcratching with a ſharp-pointed inſtrument, almoſt as well as enamel. The manner of preparing the ſhell-lac varniſh is as follows.

" Take of the beſt ſhell-lac five ounces ; " break it into a very groſs powder, and put " it into a bottle that will hold about three " pints or two quarts. Add to it one quart " of rectified ſpirit of wine, and place the " bottle in a gentle heat, where it muſt con- " tinue two or three days, but ſhould be fre- " quently well ſhaken. The gum will then " be diſſolved, and the ſolution ſhould be " filtered through a flannel bag ; and when " what will paſs through freely is come off, " it ſhould be put into a proper-ſized bottle, " and kept carefully ſtopped up for uſe. " The bag may alſo then be preſſed with the " hand till the remainder of the fluid be forced " out ; which, if it be tolerably clear, may be " employed for coarſer purpoſes, or kept to

" be added to the next quantity that ſhall be " made."

The ſhell-lac varniſh being thus prepared, a proper quantity of it muſt be put into ſmall phials of a long form, or into ſmall tin veſſels nearly of the form of glaſs phials, but in ſuch proportion that they may never be filled above two thirds. The colours muſt be added to the varniſh in theſe phials very gradually, and well ſhaken with it as each quantity is put in, till the proportion appear fit for working, which muſt be known by trying with a pencil. If the varniſh appear too thick, the fault muſt be remedied by the adding a little rectified ſpirit of wine, which will at any time immediately dilute the mixture to the proper degree. The phials, or tin veſſels, in which the colours mixed with the varniſh are kept, muſt be always ſecurely ſtopt, to prevent the exhalation of the ſpirit, and they may be preſerved in a working ſtate in that manner for almoſt any length of time. But they muſt be always well ſhaken before they be uſed, as well as during the time of uſing, at proper intervals, otherwiſe the colour will be apt to ſettle to the bottom.

This is by much the beſt method hitherto found out of painting in varniſh; the ſhell-lac not only rendering the ſpirit of wine capable of ſuſpending the colours much better than any other compoſition of this nature, but giving them tenacity and hardneſs that would render paintings on copper almoſt eternal,

nal, if not injured by fire or ſome extraordinary violence. It were to be wiſhed, that in very elaborate works this method had been always purſued inſtead of painting in oil, which is ſubject to ſo many accidents from ſlight external violences, beſides the decay and injurious change which the oil and colours ſuffer from their own internal nature, and the improper means of cleaning, that few pictures or paintings of older date are to be found perfect.

There are, however, other compoſitions of varniſh, which are uſed for painting; as the ſeed-lac varniſh, and alſo the following; which requires, however, previouſly, the preparation of the maſtic varniſh, that muſt be thus made.

"Take five ounces of maſtic in powder, "and put it into a proper bottle with a pound "of ſpirit of turpentine. Set them to boil "in *balneo mariæ* till the maſtic be diſſolved; "and if there appear to be any foulneſs, ſtrain "off the ſolution through flannel."

The maſtic varniſh being thus prepared, it may be converted into a proper varniſh for painting by the following method.

"Take then gum animi one ounce, grind "it on the ſtone with water till it become "an impalpable powder. Then dry it "thoroughly, and grind it again with half "an ounce of turpentine, and afterwards "with the colours, moiſtening it with the "maſtic varniſh till the mixture be of a due

" conſiſtence for working with the pencil. " It muſt then be put into phials or tin veſ- " ſels, as was before directed for the compo- " ſition with ſhell-lac, and diluted, where " there may be occaſion, with ſpirit of tur- " pentine."

This is inferior in all reſpects to the ſhell-lac compoſition, except where touches of pure white, or very bright colours are wanted, which ſuffer by the brownneſs of the ſhell-lac, and are preſerved in this that is nearly colourleſs. On which account, in the painting of flowers or draperies in miniature, the fine colours may be uſed with advantage this way to heighten the lights, and the reſt may be painted with the ſhell-lac varniſh.

The method of painting in varniſh is, however, more tedious than in oil or water. It is therefore now very uſual in the japan work, for the ſake of diſpatch, to lay the colours on with oil, diluted with oil of turpentine, taking care to have the mixture very thin, and to make the work riſe from the ſurface as little as poſſible. When the whole is perfectly dry, it is again laid over with ſeveral coats of thick ſeed-lac varniſh, which ſecures the colours extremely well, though not ſo as to render the whole equally hard and ſtrong with the work done in ſhell-lac varniſh.

The method of painting varniſhed work with oil may be greatly improved, by diſſolving the white gums or reſin in the oils, as was before adviſed, p. 158, for common oil painting, in caſe of more delicate and valuable undertakings. This compoſition being diluted with oil of turpentine, would work equally well with, dry much harder, and aſſimulate more with the texture of the varniſh laid over or under the paintings, than the oils ſimply uſed. It would likewiſe be attended with another advantage; which is, that the work would be ſooner dry, and fit to receive the upper coats of varniſh, which in large manufactures is an object of conſequence.

The manner of preparing the ſeed-lac varniſh and uſing it, being the ſame for this as for other purpoſes, will be ſhewn in its proper place.

CHAP. V.

Of the nature and preparation of paſtils or crayons.

PASTILS or CRAYONS are compoſitions of colours, which are reduced to the texture of chalk, and uſed dry in the form and manner of pencils for painting on paper.

There is conſiderable difficulty and nicety in the making to bring them to that due texture or conſiſtence which admits of their ſpending freely on the paper, without being ſo crumbly or brittle as not bear to have the point to be duly ſharpened. For, if they be rendered too cohesive by gums or ſuch ſubſtances as give them tenacity, they will not caſt as they ought. On the other hand, if the particles are not ſufficiently bound together, they take no proper hold of the grain of the paper, but lie on it like duſt; and the pencils in this condition are apt continually to have the points broken, or moulder away on the leaſt uſe, to an undue thickneſs. To produce this fit texture, ſo indiſpenſibly requiſite to the perfection of crayons, many ſubſtances have been uſed to mix with the coloured pigments, and to give them a proper cohoerence. But notwithſtanding the repeated experiments that have been made by numbers of perſons for the improvement of this art, it is very rare to find a ſet of ſuch crayons as may be called good. They are not, indeed, to be at all produced but by an exerciſe of ſome judgment and ſkill in the compoſition of each particular; and there are few perſons who either have ſuch, or will exerciſe their ſkill and knowledge in ſufficient degree. Recipes are therefore blindly followed; which, as the different parcels of each kind of ſubſtance differ greatly in the proportion of their qualities, though they may agree in the general nature of them, ſometimes produce good, and ſometimes bad crayons, by the very ſame rules. Whoever, therefore, would be maſter of a perfect ſet of cryons, muſt inform himſelf of the ſeveral ſubſtances and their nature, which are proper for the compoſition of them, and then having general directions for the manner, muſt proportion and adjuſt the quantity of the ingredients to each other by actual trials of the effect. This may, nevertheleſs, be done with very little trouble, and without the danger of any loſs accruing from the greateſt error in the compoſition, ſince the crayons can always be wrought over again, with ſuch additions of thoſe ingredients in which the proportion is defective as will remedy the fault. I ſhall, for theſe reaſons, enumerate the ſeveral ſubſtances that are employed for forming crayons, and ſhew what particular intentions they are to anſwer, and the method of managing them to effect that end. I ſhall then give the particular mixtures which I believe to be beſt for producing each kind of colour, with the neareſt general proportion of the ingredients. But the adapting the quantities more exactly to each other in every particular caſe I muſt leave to the operator, who muſt try the reſult of his compoſitions by drying a ſmall quantity of each ſort formed into a crayon, after he has made the mixture. This being tried on the proper paper, if it appear faulty, the proportion of the ingredients muſt be better adjuſted by adding more of that which appears to be deficient, till the due effect be produced.

All the colours which are pigments, and can be reduced to an impalpable powder, may be uſed for forming crayons. But it is proper, nevertheleſs, to be cautious, eſpecially in more elaborate works and paintings of any value, with regard to ſuch as are ſubject to fly or change; particularly roſe pink, Engliſh pink, lake, and Pruſſian blue, which are apt to turn pale, and ſometimes entirely loſe their hue. With reſpect to white, the uſe of flake white, or white lead, is beſt avoided, on account of their frequently turning black, as there are others which will even work better, and are no way liable to any ſuch change. But neither lake nor Pruſſian blue are to be wholly rejected for this purpoſe, when they are known to be thoroughly good, as they will ſtand extremely well when prepared in a right manner; only great care ſhould be taken to be certain of the qualities of any parcel before it be uſed, as the far greateſt part of the lake to be now met with will fly, and the Pruſſian blue turn pale and green in ſuch manner as to vary the teint greatly from its original ſtate.

Beſides the coloured pigments which are uſed ſimply, ſome white ſubſtances are neceſſary for the forming a proper body to ſuch as are of lighter teints, or where the colours are to be diluted and weakened, as in ſtraw colours, pinks, carnations, &c. There have been many different ſorts of bodies applied to this purpoſe, which moſt of them, by proper management, may be made to anſwer the end. The principal are flake white, white lead, tobaccopipe-clay, plaiſter of Paris, Spaniſh or Troy white, ſimple chalk and ſtarch. But pearl white, that has been hitherto overlooked, is in ſome caſes ſuperior to any of them. In this application of white bodies to form the ground or baſis of pale coloured crayons, the greateſt care ſhould be taken; likewiſe, when carmine, lake, or any coloured pigment, prepared from parts of vegetables or animals, are uſed, that the ſubſtance employed be ſuch as will not prey upon or change the colour; which chalk, flake white, and white lead, with the colours, are extremely apt to do when they are mixt together with the addition of any moiſture. But in all ſuch caſes the pearl white and plaiſter of Paris ſhould be uſed; and with reſpect to the latter, it muſt be wholly free from lime, or it will be worſe even than the others. It is beſt indeed in general to avoid any ſuch mixture of theſe colours, by ſubſtituting the coloured earths, or other mineral ſubſtances, in the place of thoſe prepared from vegetable or animal ſubſtances, as they can ſcarcely be affected or changed by any matter uſed in painting; and will, in general, equally well anſwer the purpoſe, except in the caſe of carmine, the unrivalled brightneſs of which, makes it neceſſary for pinks and carnations, as great purity and force of colour are there required.

Flake white and white lead are not ſo frequently uſed as chalk and tobaccopipe-clay for the grounds of crayons; neither, indeed, are they ſo fit for many purpoſes, as they will not mix well with many of the coloured pigments, and are liable to form too brittle pencils when cut to moderate points. The white lead has beſides the dangerous quality of being ſubject to have its whiteneſs changed into the proper metallic colour of the lead, as we ſee in many of the older drawings and ſketches where it has been uſed. The great whiteneſs of the flake, nevertheleſs, recommends it where touches of a very great light are required. It may not be amiſs, therefore, to have a crayon of it for ſuch occaſions; but it is beſt to omit wholly its uſe in all caſes where the other whites will anſwer the purpoſe.

Tobaccopipe-clay was formerly in great uſe for forming the paler crayons; but it is much neglected now, except in thoſe made for ſale. For, beſides its drying to be too hard, and not ſpending freely on the paper, it gives the colours a heavineſs and deadneſs that may be avoided by the uſe of other whites; to ſome of which it is therefore on all accounts inferior. It may however ſerve for ordinary occaſions, as it will produce crayons by being ſimply mixed with the coloured pigments: and therefore requires much leſs ſkill and trouble to be compounded with them than the ſofter whites that demand the aid of ſome binder or glutinous body to give them a due coheſion.

Plaiſter of Paris has alſo been frequently uſed for the baſis of pale crayons, to which purpoſe it is in one reſpect well adapted; becauſe, when it is pure, that is to ſay, made only of the powdered alabaſter, it is very innocent with reſpect to the more tender colours; but then it is too coheſive, and wants the flakineſs of chalk; which defect has been attempted to be remedied by the dipping the crayons formed of it in olive or linſeed oil.

Spaniſh or Troy white, which, as we have ſeen before, is chalk and alum calcined and waſhed over, is uſed by ſome for a ground for the pale crayons. The difference in its effect from ſimple chalk waſhed over conſiſts only in its being leſs liable to prey on the colours made from the parts of vegetables or animals. But as the pearl white, or plaiſter, are much leſs hazardous in that point than either, the uſe of it ſeems no way neceſſary.

Chalk is the beſt adapted by its texture to the forming the ground of pale crayons of any of the whites hitherto uſed, as it will caſt more freely, and at the ſame time retain a due coheſion, when mixt with proper binders or glutens, better than any of the other whites now in practice. It is, therefore, much the beſt ſubſtance for mixing with all the coloured pigments which are not ſubject to be changed; but with reſpect to ſuch as are, the pearl white, or plaiſter of Paris, ſhould be ſubſtituted in its place. It is alſo the beſt for forming white crayons for common purpoſes, which may be done by a very ſimple treatment, as below directed.

Starch has been frequently uſed along with ſome of the other whites for giving a due texture to crayons. But it is no where neceſſary, except in the caſe of white flake; and, as the prepared flake white of the ſhops contains a large proportion, it is unneceſſary when that is uſed, which will generally be the caſe, as the levigation of the white flake is too troubleſome for thoſe who do not make ſuch matters their buſineſs.

The laſt claſs of ſubſtances uſed in the compoſition of crayons, and on which indeed principally depends their perfection, is the binders or glutens required to give pulverine bodies, of which the crayons are compoſed, a due tenacity to render them capable of being formed into maſſes that will bear the form and employment of pencils. There has been a variety of different matters applied to this purpoſe, moſt of which may in ſome degree effect it; but the principal are ale wort,—gum tragacanth, — gum Arabic, — ſize, — milk,— oatmeal,—ſugar-candy, — olive oil,—and linſeed oil.

The wort of ale or beer, either in its original ſtate, or rendered more thick by boiling, has been found to anſwer the end of a binder, for the forming crayons, where chalk or earthy bodies are uſed, better than any of the others, as it gives them a proper coheſion, by its vicidity, without drying to that brittle ſtate to which the gums are ſubject. It is not, however, in the caſe of vermilion, and ſome other ſubſtances, which have no coheſive attraction of themſelves, ſufficient alone to give the due tenacity; and muſt therefore be aſſiſted by gum tragacanth, or ſize, or ſome ſuch other viſcid matter.

Gum tragacanth is uſed as a binder, by diſſolving it in the ale wort, or whatever fluid is employed for the tempering crayons. It is preferable, for this purpoſe, to gum Arabic, or the other gums which diſſolve in aqueous fluids, becauſe it thickens in the water, and mixes itſelf equally throughout the whole ſubſtance of the compoſition when dry; whereas the others are apt to form a cruſt on the outſide of the maſs, and render the paſtils or crayons of an unequal texture.

Gum Arabic has been alſo uſed for tempering crayons in the ſame view as gum tragacanth; but, for the reaſon juſt given, is much inferior to it.

Size is alſo ſometimes applied to the ſame purpoſe in making crayons as gum tragacanth, and differs not greatly from it in its effect.

Milk has been uſed for the compoſition of crayons, in the ſame view as the ale wort, where only a ſmall addition of coheſive power was required to be added to the ſolid bodies which formed them. But it is only in ſuch caſes it can be of any avail, as the ale wort, or others of greater efficacy, are in moſt caſes wanted.

Oatmeal, or rather the decoction of it, made, as in the caſe of water-gruel, and ſtrained, has likewiſe been employed for the ſame end as milk, and anſwers well enough in the caſe of the deep Pruſſian blue, indigo, and ſuch bodies as are apt to dry gummy; becauſe, though the decoction of oatmeal gives only a ſmall degree of coheſion, yet it prevents that coaleſcence from the attraction of the parts of thoſe bodies on each other which produces this brittleneſs.

Olive oil, as likewiſe the linſeed, have been uſed to give the crayons a more flaky and chalky texture, by dipping into it, after they have been duly heated, ſuch as are made of plaiſter of Paris, or tobaccopipe-clay, in order to ſoften them, and remove that unkindly coheſion which prevents the ſticking freely on the paper.

Wax has been alſo uſed by ſome in the light of a great improvement as a binder to crayons. The pretended utility of it is, that it will render the crayons ſo tenacious and fixt on the cartoon as not only to be ſecure from ſhaking off by any concuſſion, but even to bear the rubbing with a bruſh. This quality does not, however, compenſate for the great defect all ſuch crayons will be found to have; which is, that they cannot make any of thoſe delicate touches and finiſhings that give the merit to crayon painting. On which account they can only be employed for coarſe purpoſes, and are conſequently of very little conſequence to painting in thoſe caſes where crayons have advantages over other methods.

I ſhall here give ſome general inſtructions for the compounding crayons of the ſeveral colours and teints; but at the ſame time muſt leave it to the diſcretion of the operator to adjuſt the exact proportion of the binders or glutens by actual trial, as the ſubſtances uſed vary too much in the degrees of their qualities in different parcels to admit of any ſtandard proportion being given.

Of white crayons.

For forming white crayons for common purpoſes, chalk in its natural ſtate is ſuperior to any compoſition. It ſhould be choſen white, pure, and of the moſt cohering texture; and it muſt be cut firſt into ſquares by means of ſmall ſaws made for this uſe, of three inches length, and a quarter of an inch in thickneſs, and afterwards formed into a proper pencil-ſhape by taking off the corners with a penknife, and duly ſloping the point.

Where an extraordinary degree of whiteneſs is required, a crayon may be made from flake white as prepared by the colourmen. It muſt be well powdered and moiſtened with milk to the conſiſtence of a paſte, and then formed in the pencil-ſhape and dried, but without heat, as that would tend to injure the whiteneſs, by changing the colour of the flake in the ſame manner as in the production of maſticot. If the crayon thus made appear to want tenacity, it muſt be worked over again with a freſh quantity of milk; or a little gum tragacanth may be added to the milk. This crayon, however, ſhould not be uſed where chalk will be ſufficiently bright; for all kinds of ceruſe, as I obſerved before, are ſubject to have their colour changed by accidents not eaſily to be guarded againſt.

Of red crayons.

For red crayons of the ſcarlet hue, vermilion and red lead may be uſed, with ale wort boiled, till it appear ſlightly glutinous to the touch, and further inſpiſſated by the addition of gum tragacanth; the proportion of which may be a ſcruple to a pint of the thick wort. With this gluten, the vermilion, or red lead, muſt be reduced to the ſtate of a paſte, by grinding them together, and then formed into the proper ſhape, and dried with a gentle heat.

Where the orange caſt of red lead is not particularly wanted, it is ſafer to uſe vermilion; for though red lead will ſtand much better uſed this way than in oil, yet the vermilion is ſtill more ſecure, as nothing can change it without a burning heat.

The paler crayons of the ſame colour may be made, by mixing waſhed chalk with any of theſe colours, which may be done in three proportions; the firſt with an equal weight of the chalk, the ſecond with double the weight, and the third with treble. But if other teints are wanting, the proportion may be varied otherwiſe according to the occaſion. Theſe compoſitions ſhould be formed in the manner above-mentioned, by means of ale wort inſpiſſated by boiling; but the wort ſhould be thicker where the quantity of the chalk is leſs, according to the three proportions; becauſe, after it has been moiſtened, and is again dried, chalk has a conſiderable coheſion of itſelf.

The ſcarlet ochre gives a fouler red crayon, but yet very uſeful, if it be compounded with the ale wort inſpiſſated both by boiling and the addition of gum tragacanth, in the proper manner directed for vermilion.

Scarlet ochre may likewiſe be formed by compoſition with chalk, into paler teints, in the ſame way as vermilion.

Common Indian red may be likewiſe treated in a parallel manner, and will give other teints of red.

Red ochre requires no compoſition; but if it be choſen pure, and of a good colour, will afford uſeful crayons by the ſame management as chalk.

Lake muſt be uſed for crimſon crayons, and may be brought, when well ground with ale wort, to a proper texture; but if, as is the nature of ſome parcels, it appear too gummy, make it up with the decoction of oatmeal inſtead of the ale wort. It is proper to be very careful in the choice of lake for crayons; for, as it is very apt to fly when not properly prepared, the conſequence in crayon painting is in ſuch caſes very bad, ſince it will much ſooner change when uſed in that manner than in oil.

The paler teints of the lake muſt be produced by the admixture of ſeveral proportions of white, in the ſame manner as the foregoing colours. The white employed ſhould not, nevertheleſs, be chalk, for the reaſons before given; but pearl white, or plaiſter of Paris. I think the former much the beſt; but in the compounding it into crayons with the lake, a ſtronger binder is required than in the caſe of chalk. The ale wort ſhould therefore be well inſpiſſated by boiling for thoſe crayons where the proportion of lake is greateſt; but, for the others, it ſhould be adequately rendered yet more viſcid by the addition of gum tragacanth.

It would be extremely proper to have crayons of carmine, if the price did not make the uſe of it too expenſive. Conſidering that circumſtance, it is more expedient to uſe it rubbed in by the leather roller in the manner below directed, by which it may be conveniently laid on where it may be neceſſary.

A ſmall crayon compounded of the beſt and moſt ſcarlet lake, with about a third part of carmine, ſhould, however, not be wanting. They may be worked up with milk, and a little decoction of oatmeal, with a ſmall proportion of gum tragacanth; but ſome carmine is ſufficiently glutinous, and requires no binder, which ought therefore to be firſt tried before the binders are added.

Small crayons muſt likewiſe be made of carmine and pearl white in different proportions, and the ale wort muſt be more or leſs inſpiſſated according to the quantity of white; but as the carmine differs greatly in different parcels as to its gummy conſiſtence, this muſt be regulated by diſcretion.

Roſe pink, when good, forms a crayon which has merit with regard to its beauty, if its defect in other reſpects did not forbid the uſe of it. It may be made into crayons without any compoſition, in the ſame manner as chalk, where it is of ſo firm a texture as it is commonly found to be; but where it happens to be of a looſer, it muſt be brought to a proper ſtate of coheſion by ale wort. It is, nevertheleſs, ſcarcely worth while to take the trouble of forming it any way into crayons, as the colour will always fly if the cold air have acceſs to it, and it can never, therefore, be prudently employed in paintings of any value.

Of blue crayons.

For a deep blue crayon, the darkeſt Pruſſian blue may be formed into a crayon by grinding it with the decoction of oatmeal. If the tenacity be not ſufficient, the ale wort muſt be added.

Indigo,

Indigo, when good, will likewiſe produce a deep blue crayon, with ale wort inſpiſſated by boiling.

For paler blues, Pruſſian blue of different degrees of lightneſs may be uſed with ale wort; but the ale wort muſt be inſpiſſated by boiling, or the addition of ſize or gum tragacanth in proportion to the lightneſs; the darker kinds of Pruſſian blue being of a more glutinous nature than the lighter.

Verditer will alſo make a good blue crayon, but it muſt be uſed with ale wort ſtrongly inſpiſſated.

Bice ſhould likewiſe compoſe another crayon treated as verditer.

Crayons ſhould likewiſe be formed of verditer, or bice, with chalk in different proportions, and compounded by means of the ale wort thickened by boiling.

Ultramarine being too dear to form crayons, ſhould be uſed in the manner above directed for carmine.

Of yellow crayons.

The prepared orpiment, or pigment called King's yellow, forms the brighteſt and fulleſt coloured yellow crayon; but the poiſonous quality, and nauſeous ſcent of it, are ſuch faults as render it on the whole much inferior to that next mentioned.

The King's yellow may, however, be formed into a crayon with ale wort inſpiſſated by boiling and the addition of gum tragacanth, but it muſt be dried without any heat.

The turpeth mineral, well levigated and waſhed over, makes a very fine crayon, of a cool, but very bright yellow colour. It may be treated for this end exactly in the manner above directed for vermilion.

Dutch pink and Engliſh pink make crayons of a pretty good yellow colour, but are not ſo ſecure from flying as the two above-mentioned. When they are of a firm texture, they may be uſed as the chalk, without any other preparation than cutting them into a proper form; but where they are of a more ſoft and crumbly ſubſtance, they muſt be worked up with the inſpiſſated ale wort.

Yellow ochre may alſo be formed into a crayon in the ſame manner as chalk, or it may be ground and waſhed over, and then uſed with the inſpiſſated ale wort.

More diluted teints of yellow may be procured by mixing chalk with any of the above-mentioned pigments, and forming them into crayons in the manner before-mentioned for the other colours.

Of green crayons.

The cryſtals of verdigriſe, properly managed, make the brighteſt green crayon. They ſhould be reduced to a very fine powder by grinding on the ſtone with ſpirit of wine, or oil of turpentine, and then formed into a paſte by ale wort highly boiled, and inſpiſſated ſtill further by gum tragacanth; but as little fluid as poſſible ſhould be employed in their compoſition. They ſhould likewiſe be dried without heat.

Verdigriſe will make a light blue green crayon, if treated in the ſame manner.

Pruſſian blue and turpeth mineral, compounded in different proportions, form alſo a variety of good green crayons. They muſt be worked up with ale wort thickened by boiling.

Pruſſian blue and Dutch pink make likewiſe a pretty bright green crayon, being formed by means of the inſpiſſated ale wort.

Verditer and turpeth mineral form a good pale green; but they require ale wort both thickened by boiling and the addition of gum tragacanth.

Blue bice and turpeth mineral, or Dutch pink, make another kind of light green crayon, being treated in the ſame manner, except that when Dutch pink is employed the ale wort requires only to be well thickened by boiling.

Crayons may likewiſe be formed of any of the above-mentioned green pigments and chalk, by the means before directed with regard to the other colours.

Of orange crayons.

King's yellow, or turpeth mineral, with red lead, or vermilion, makes a bright orange crayon. They muſt be compounded with ale wort thickened, as well by gum tragacanth as boiling.

Orange crayons may likewiſe be formed from Dutch, or Engliſh pink, compounded with red lead, or vermilion; but the ale wort need not in this compoſition be ſo ſtrongly inſpiſſated as for the laſt.

Chalk may be added to either of theſe in different proportions, to vary the teints in the manner above directed for the reſt; or good crayons of a paler orange, where brightneſs is not required, may be formed from Spaniſh annatto compounded with chalk, and worked up with ale wort ſlightly inſpiſſated.

The Spaniſh annatto uſed alone, being levigated with oil of turpentine, and formed by the addition of the decoction of oatmeal uſed in the moſt ſparing manner, makes likewiſe a very good crayon of the full orange colour. But the preparation of this is more troubleſome than thoſe given above, which will in general anſwer the ſame purpoſe.

Of purple crayons.

A very bright purple crayon may be formed of deep Pruſſian blue and carmine, compounded by means of the decoction of oatmeal; but this being expenſive, muſt be made ſmall, and reſerved only for thoſe caſes where great brightneſs is neceſſary.

Deep Pruſſian blue and lake, treated as the above, form a crayon next in brightneſs to the above.

For a leſs bright purple, indigo may be uſed in the place of the Pruſſian blue; but the teint will not be ſo deep, and ale wort ſlightly inſpiſſated may be uſed inſtead of the decoction of oatmeal.

For coarſer purples, indigo may be compounded with vermilion; but they will be much paler than the above, and for this compoſition the ale wort muſt be well thickened by boiling, and a ſlight addition of gum tragacanth.

Of brown crayons.

For forming a full brown crayon, neither inclining to the olive nor orange, mix brown ochre and biſtre, and work them up with the ale wort inſpiſſated moderately by boiling.

Spaniſh brown, umbre, and the common and true Indian red, may likewiſe be compounded in the ſame manner with biſtre into crayons of different teints of brown; and ivory black may be added, where neceſſary, to darken them and increaſe the variety.

Spaniſh brown and umbre may be likewiſe formed alone into brown crayons, by means of the ale wort inſpiſſated by boiling, and a ſmall addition of gum tragacanth.

For diluted browns calcined fuller's earth may be employed, either alone, or mixt with chalk in different proportions. The crayons muſt be formed by means of ale wort moderately inſpiſſated by boiling.

Diluted browns may likewiſe be formed by adding chalk to any of the above compoſitions for browns.

Of black and grey crayons.

Black crayons may be formed out of pieces of charcoal well burnt, by cutting them into a proper ſhape in the manner directed for chalk. The kind of charcoal, ſaid to be the beſt for this purpoſe, is that made from the wood of the willow.

Good black crayons may likewiſe be formed of ivory black, mixt with a little very deep Pruſſian blue or indigo. It muſt be worked up by ale wort, boiled thick with a ſmall addition of glover's ſize.

Grey crayons may be formed of the ivory or lamp black, mixt with chalk in different proportions, and compounded by means of ale wort well inſpiſſated by boiling.

The carmine, ultramarine, or any other colour which may be too dear, or not had in ſufficient quantity to form crayons, may be uſed by means of the leather roll above-mentioned. This roll is only a piece of ſhamoy leather formed into a kind of long cone, by rolling it in a ſpiral manner, and then twining thread tightly round it to keep it from unfolding. The leather muſt be ſo managed in the rolling as to form a point of the degree of bluntneſs required, or if it be too blunt it may be ſharpened with a penknife. With the point of this roll breathed upon, the carmine, &c. may be taken and laid on the painting in ſuch touches as may be required, and the effect will be nearly the ſame as if the point of a crayon had been uſed. This roll will likewiſe be found uſeful in *ſweetening* (as it is called) the colours, by rubbing the edges of the teints together, where the ſurface is not large enough to admit the finger to do that office.

CHAP. VI.

Of the grounds for the ſeveral kinds of painting.

SECT. I. *Of the grounds for oil painting.*

THE ſubſtance or matter on which oil paintings are made, unleſs in very particular caſes, are canvas, wood, or copper-plate. The preparation or covering of theſe, in order to their receiving the proper colouring, muſt be therefore different, according to the different ſubſtance in queſtion.

The pieces of canvas, prepared by proper primings, are then by painters called *cloths*, and are the moſt common grounds for oil painting. But theſe cloths, though they are diſpenſed with in general, becauſe painters think it too much trouble to prime them themſelves, and therefore make ſhift with what the colourmen will afford them; who, on their ſide likewiſe, conſult nothing but the cheapeſt and eaſieſt methods of diſpatching their work, are yet at preſent prepared in a faulty manner in ſeveral reſpects. In the firſt place, the whole covering is apt to peel and crack off from the cloth, by the improper texture of the under coat, which is formed of ſize and whitening, and is both too brittle and too little adheſive, either to the cloth or upper coat, to anſwer well the purpoſe. In the ſecond place, the oil employed in the compoſition of any paint uſed on ſuch grounds is extremely apt to be abſorbed or ſucked in by them, and conſequently to leave the colours with which it was mixt deſtitute, in a great degree, of what is neceſſary for their proper temperament. This is called, though improperly, *the ſinking in of the colours*, and is attended with ſeveral inconveniences; particularly, that the effect of the painting appears very imperfectly, while the colours are in this ſtate and deprives the painter, as well as others, of the power of judging properly of the truth of the performance. It is indeed practiſed ſometimes to varniſh over the ground, which will prevent the ſinking in; but there is a hazard in this, that the upper coat may leave the ground, and the painting conſequently come off. Whoever, therefore, would have good cloths, free entirely from this diſadvantage, muſt direct the preparation of them themſelves, and they may produce them in perfection by the following means.

"Let the cloths be firſt well ſoaked with "drying oil laid on hot; and when nearly "dry, let two or three coats of drying oil "and red ochre, mixed as thick as can be "worked, be ſpread over it. Then, the laſt "being dry, let the cloth be bruſhed over with "hot drying oil, as long as it appears to "ſink in; and, laſtly, let it be covered with "a coat of white lead and oil, rendered grey, "or of any other colour deſired, by admixture "of the proper pigments. This laſt coat may "be poliſhed to a due degree by rubbing with "a pumice ſtone, or by glazing it with the "glaſs poliſhers uſed for linen, and called *callender ſtones*."

In priming wood, or preparing it to receive the oil colours, the ſame errors are generally committed; for the method almoſt univerſally practiſed, is to clear-coat (as it is called) with ſize and whiting, and then to cover it with white lead and oil. But the ill effects of ſuch a method are ſtill greater, in this caſe, than in that of canvas; ſince, if any moiſture find acceſs to the wood, the paint riſes in bliſters, which are liable to be burſt, and to cauſe a flaking off, and peeling of the paint, in a very detrimental manner. For paintings of any value, the wood ſhould, therefore, be bruſhed over with hot drying oil as long as it will ſoak in, and then covered with a coat of white lead, or flake, coloured according to what may be deſired. Even in the caſe of houſe or coach-painting, the clear-coating with ſize and whiting ought to be omitted; and, in its place, a coat of drying oil with ſome white lead and ochre, but not ſo much as to make it ſtiff, ſhould be uſed as the firſt priming, inſtead of the ſize and whiting. This method would both preſerve the wood much better, and prevent the bliſtering and peeling, and, in ſome degree, the ſinking in of the colours that attend the common method.

When copper-plates are uſed, there is no occaſion for any other priming than one coat of oil and lead, or ochre, rendered of the colour deſired; but ſuch plates are ſeldom employed but for delicate and elaborate paintings. The ſurface of the priming ought to be made as ſmooth as the plate itſelf, by rubbing with the pumice-ſtone, or glazing with the callender-ſtone. But there is another method very effectual for making a fine ground on the copper-plates, which is, the uſing flake white and fat oil, with any colour required;

which being laid on the plates placed in an horizontal poſition to dry, will poliſh itſelf very highly by the running of the oil. The oil uſed for this purpoſe ſhould be thoroughly fat; which, though not at preſent to be had of colourmen, may be eaſily made by the method below taught, with very little expence and trouble. This method of producing grounds by fat oil, perfectly ſmooth, ſecured from any ſinking in of the colours, and in all other reſpects much better than any other, may be practiſed with advantage on cloths or wood, as well as copper-plates, the cloths being firſt prepared for the laſt coat in the manner before directed, and the wood ſoaked with drying oil.

SECT. II.

Of the grounds for painting in water colours, or primature painting.

THE ſubſtance on which paintings with water colours are uſually made, are cartoon paper, (or a kind deſigned for this purpoſe) common paper, or vellum, and ivory.

When paper of any proper kind is uſed, it is ſufficient to prime it with iſinglaſs, ſize thickened properly with pearl white, and any pigment which will afford the colour the ground is deſired to be. But common paper may be rendered ſtronger and fitter to receive the colours by laying on the back of it a coat of ſtarch boiled with water to a moderate conſiſtence, and rendered yet more tenacious by the addition of a little iſinglaſs. This ſhould be laid on very ſmoothly with a bruſh; and the paper, when near dry, muſt be put betwixt the leaves of a book, or betwixt two ſheets of paper and two boards, and compreſſed by a weight laid on the books or boards. Two ſheets of paper cemented together by the ſtarch and iſinglaſs, and treated in the ſame manner, make a very commodious ſubſtance for painting in miniature. It has been adviſed to pounce paper deſigned for painting with water colours, or to rub them over with alum water. But as the intention of this is only to guard againſt the defect of paper that will not take ink, or other aqueous fluids, without running, it is much better to avoid the uſe of all ſuch paper; for the pounce prevents the colours working freely with the pencil, and the alum water changes ſeveral of the colours; as for example, the litmus, and archal, if uſed, would be turned to a red from blue or purple.

Vellum has been likewiſe directed to be pounced by ſome of thoſe who have pretended to teach the beſt methods of managing water colours. But, if it be good, it requires no other preparation than the ſtraining on a paſteboard, or other ſuch proper body, and priming it in the manner directed for paper; and if it ſhould happen to be greaſy, the rubbing it over with the gall of any beaſt will remedy the defect, without the inconvenience produced by the uſe of pounce. The ſtraining the vellum on the paſte-board muſt be effected by cementing them together with the ſtarch prepared as above, or with iſinglaſs ſize, which is better for this purpoſe. The vellum muſt be alſo cut ſo much bigger than the paſte-board that it may lap over on every ſide; in the doing which, care muſt be taken that it be equally ſtretched on each ſide, ſo as to render the whole perfectly even.

When ivory is uſed as a ground, it muſt be firſt rubbed over with the juice of garlic, and then ſtained by any waſhing colour of the teint deſired as a ground, if any other be preferred to white.

SECT. III.

Of the grounds for painting in diſtemper.

THE ſubſtance or matter on which paintings in diſtemper are generally made, are canvas or wood.

When canvas is uſed, as for ſcenes, &c. it muſt be coated with ſtrong ſize and whiting till it be of a thickneſs to take a water poliſh, and then it ſhould be primed with plaiſter of Paris free from lime, and mixed up with ſize, as before directed for the plaiſter, as it will then bear lake, carmine, or other colours prepared from vegetables, without preying upon, or changing them. The manner of giving the water poliſh is by rubbing over the ground with a wet cloth till it be perfectly ſmooth.

When wood is uſed, it ſhould be firſt bruſhed over ſeveral times with thin ſize; or, in caſe the ſurface be not quite ſmooth, with ſtrong ſize and plaiſter of Paris, to fill up the inequalities or holes, if there be any.

SECT. IV.

Of the ground for painting in freſco.

THE ground for painting in freſco is ſtucco, which may be laid floated and prepared in the uſual manner that ſtucco is treated. But no more muſt be laid at one time than can be painted before it be dry; becauſe afterwards the colours, which have no vehicle in this kind of painting but water, will not cohere with the ground after it be once dry. As this ground can be completely prepared by the common workmen in ſtucco, it ſeems needleſs at preſent to give a more minute deſcription here.

SECT. V.

Of the grounds for varniſh painting.

THE ſubſtance or matter on which varniſh paintings are made, is, for the moſt part, copper, iron, and wood. As the painting ground is not covered with the colours in moſt works of this kind, it muſt conſequently be of the varniſh itſelf the work conſiſts of. But where it is intended to be painted over, as in the caſe of regular pictures, a priming may be given of ſhell or ſeed-lac varniſh, mixed with the proper colours for the ground deſired.

CHAP. VII.

Of the methods of varniſhing and preſerving pictures and paintings.

THE method of preſerving paintings in oil, is, by coating them with ſome tranſparent and hard ſubſtance, as a varniſh, to ſecure the colours from the injuries of the air or moiſture, and to defend the ſurface from ſcratches or any damages the painting might receive from ſlight violences.

The ſubſtances that have been, or may be uſed for this purpoſe, are gum Arabic, glair or whites of eggs, iſinglaſs ſize, and varniſhes formed of gum reſins, diſſolved in ſpirit of wine, or oil of turpentine; which laſt, where oil of turpentine is uſed, are called oil varniſhes.

Gum Arabic has been uſed, diſſolved in water, as a varniſh for pictures and paintings, on account of its being both more eaſily laid on and taken off than the varniſhes formed of ſpirit of wine, or oil of turpentine. It is more eaſily laid on, becauſe it may be made exactly of that degree of viſcidity with which it can be beſt worked with a bruſh or pencil; and becauſe it is totally free from that accident called *chilling*, which attends all varniſh made with ſpirit of wine. There is, however, along with theſe, another quality of ſo bad a kind that its effects more than countervail theſe advantages in the uſe of gum Arabic as a varniſh for paintings; this is, that, as it dries, it is extremely apt to crack, and give ſuch appearance of flaws and ſcratches as obſcure and diſform the painting to an intolerable degree, and therefore this gum is at preſent much rejected with reſpect to its application, and the ſubſtance we ſhall next conſider ſubſtituted in its place. The addition of ſugar, or ſugar-candy, will greatly prevent the cracking of gum Arabic; but then it gives a viſcidity or ſtickineſs to the gum that makes the face of the painting ſully, and is in a manner equally detrimental with the cracking of the gum.

Glair of eggs, beat to an unctuous conſiſtence, and ſpread with a proper bruſh over the paintings, anſwers much the ſame end as gum Arabic; but has the like advantages with much leſs of the bad quality of cracking; for which reaſon it is generally preferred to that gum. It has, nevertheleſs, one great defect, which is its not laſting, for it requires to be renewed frequently, as either moiſture or great dryneſs of the air injure it. It is uſual to mix a little brandy or ſpirit of wine with the glair of the eggs, in order to make it work more freely with a bruſh; as alſo a lump of ſugar to give it more body, and prevent its cracking; from which, after all, it will not be entirely free, after it has ſome time laid on, if the picture be put into a very dry place.

Iſinglaſs ſize may be uſed for a varniſh in the ſame manner as the ſolution of gum Arabic, or the glair of eggs; and if a little honey or ſugar, about a fourth or fifth of the weight of the iſinglaſs be added to it, it will cover more effectually than either of them, and yet be free from cracking. This is not, however, ſo laſting a varniſh as the gum reſins, eſpecially if the painting or picture be brought into a damp ſituation; and indeed, in all caſes, it is apt to turn very yellow with time. But where there is a proſpect of having occaſion to take off the varniſh for altering the painting, this will be found a very good one: as it may be entirely removed by means of ſponge and hot water.

Ther

There have been many compoſitions invented for ſpirit and oil varniſhes for paintings; but the multiplying a number of ingredients in ſuch compoſitions is by no means attended with advantages that are equivalent to the trouble. I will, however, give one of the applauded recipes of each kind; and then ſubjoin to it another more ſimple, which I believe will better anſwer the purpoſe.

"Take of gum ſandarac half a pound, of "Venice turpentine one ounce and a half, of "the gums animi and copal, each three quar"ters of an ounce, of maſtic half an ounce, of "Benjamin, gum elemi, and white reſin, each "two drams, of rectified ſpirit of wine one "pound. Powder the Benjamin and gum "animi, and put to them and the Venice tur"pentine, contained in a proper-ſized phial, "eight ounces of the ſpirit of wine. To the "copal and reſin powdered, put, in like man"ner, in a phial, ſix ounces; and to the "powdered gum elemi two ounces. Let "them ſtand, ſhaking the phials frequently, "till the gums, &c. be diſſolved. Then ſtrain "all the ſolutions through a piece of fine li"nen into one bottle; and after the mixture "has ſtood ſome days, decant off as much as "will ſeparate clear, and keep it in a bottle "well ſtopt for uſe."

Some omit the copal, which is in fact ſo much the ſame with the animi that there is no certain mark of diſtinction known, and put in its place the ſame quantity of gum ſarcocol; but it is not of any conſequence which is admitted, nor whether three parts in four of the ingredients be rejected, for the following will anſwer the end equally well.

"Take of the gums maſtic and ſandarac,
" powdered groſsly, each ſix ounces, of Ve-
" nice turpentine half an ounce; diſſolve
" them in a quart of highly-rectified ſpirit of
" wine, and ſtrain off the ſolution as the
" above. If this be wanted harder, an equal
" weight of the gums animi or copal may be
" added, and the quantity of ſpirit of wine
" doubled."

In the uſing this kind of varniſh, great care muſt be taken that the picture receive no damage from it; for the diſſolving power of the ſpirit of wine will ſometimes reach the oil of the painting, and conſequently diſturb the colours.

The varniſh ſhould therefore be ſpread with as little and as gentle work of the pencil as poſſible; and care ſhould be taken likewiſe that the painting be thoroughly dry before the operation be attempted. There is alſo another nice circumſtance to be attended to in the uſe of this kind of varniſh, which is, to avoid what is called *the chilling of it*. This will certainly happen, if the varniſh be not laid on in a very warm place, or the picture itſelf warmed to a moderate degree; and it will be ſtill more liable to happen, if the ſpirit of wine employed be not very highly rectified. If th varniſh appear to be *chilled*, (that is, when the parts of the gums do not attract each other, but precipitate from the phlegm, left by the ſpirit on its evaporating away, in the form of a powder, which gives a miſty turbid appearance to the ſurface, inſtead of a tranſparent ſhining one) another coat ſhould be laid over it, which will in general remedy the miſchief. Indeed leſs than two or three coats of this kind of varniſh is not ſufficient to preſerve the painting, and bring out a due effect of the colours, if they are in that ſtate called *ſunk in*, occaſioned by the attraction of the cloth on the oils mixed with them.

The following is a recipe for an oil of turpentine varniſh of the more compound kind.

"Take of the gums maſtic and ſandarac, "each four ounces, of white reſin two ounces, "of the gums ſarcocol, animi, copal, and olibanum, each one ounce. Powder them groſsly, and put them into a phial with two "pounds of oil of turpentine. Stop the phial, "but not too faſt leſt it burſt, and place it "in any heat, the greater the better, under "that which will make it boil. Let it ſtand "there till the gums be diſſolved, or at leaſt "ſo much of them as will be diſſolved; then "ſtrain off the ſolution for uſe."

The ingredients, except the maſtic and ſandarac, may be omitted at diſcretion; and with reſpect to the gums animi and copal, under which names a variety of gums brought from the Eaſt and Weſt Indies, as well as Africa, paſs, there are a very few parcels which will be found to diſſolve in oil of turpentine. Indeed I have never found any that would be ſo diſſolved; but recipes like this have been given upon very good authority. The following therefore will be found a much cheaper, leſs troubleſome, and equally good varniſh with that made with this complex mixture.

"Take of gum ſandarac two ounces, of "maſtic and olibanum each an ounce and half; "or three ounces of maſtic, and Venice turpentine half an ounce; powder them, and "diſſolve them in half a pound of oil of turpentine, proceeding as in the above."

When this kind of varniſh is uſed, it is particularly neceſſary that the painting ſhould be thoroughly dry, and the pencil uſed as gently and ſparingly in the laying it on as poſſible: for the oil of turpentine is extremely ready to diſſolve the oil of the painting, if it be the leaſt within its power; on which account the varniſhes of this ſort are much leſs uſed now than formerly. This varniſh, however, will ſpread much more eaſily than that with ſpirit of wine, and is not ſubject to chill, even though it be laid on without the aid of any warmth. But it is proper, nevertheleſs, to be very careful that there be no damp or moiſture on the ſurface of the painting, which would prevent the varniſh from taking hold, and wholly fruſtrate the intention of it.

Varniſhes have been uſed, likewiſe, formed of the gums ſandarac, olibanum, and Arabic, with white reſin and turpentine, diſſolved in linſeed oil, but they are greatly out of uſe now; as ſuch varniſhes are ſlow in drying, and the linſeed oil will turn yellow, beſides the diſadvantage ariſing from the impracticability of ever taking them off the painting again, whatever occaſion there may be for it. But a very ſecure and good varniſh may, nevertheleſs, be made, by diſſolving two ounces of ſandarac and olibanum, with half an ounce of Venice turpentine, in half a pound of oil nut or poppy oil that is white; and if too fat for other uſe, the better.

All theſe varniſhes muſt be carefully laid on with a pencil or bruſh, according to the circumſtances before intimated to be proper for each kind. But with reſpect to thoſe made of ſpirit of wine, or oil of turpentine, particular care muſt be taken not to paſs the pencil or bruſh more than once over the ſame place; for, otherwiſe, it will produce ſtreaks and inequalities, which ſpoil the effect.

Paintings in miniature are preſerved by means of plates of glaſs, or the talc, called iſinglaſs, placed in the frame before them. There is no particular method to be obſerved in doing this, but to make the frame ſo compact that the air may have no acceſs, which otherwiſe will ſometimes prey upon the colours.

Paintings in diſtemper, where they are of conſequence enough to merit ſuch care, may be rendered more durable, and preſerved from foulneſs, by varniſhing them with hot ſize boiled to a ſtrong conſiſtence, in which a fifteenth or twentieth part of honey has been diſſolved.

Paintings in freſco, being deſigned to bear the inclemency of the air and weather, are calculated, from the nature of the colours and grounds, to preſerve themſelves without any protection or means of ſecurity.

Paintings in varniſh require no means of preſervation, but from violence; the varniſh itſelf being a very ſufficient defence of the colours againſt the air, moiſture, or all other ſubſtances that might effect them.

Crayons muſt be preſerved as paintings with water colours, by plates of glaſs or iſinglaſs. There have been many experiments made to diſcover a method of varniſhing and giving adheſion to the colours, to prevent their being ſo eaſily rubbed off, or indeed ſhaken off, with any very briſk motion.

There are ſeveral methods of fixing crayons now practiſed, one of which is ſaid to be that of Mr. La Tour, the famous French painter in crayons. But all theſe methods are at preſent kept as cloſe ſecrets in the hands of perſons who practiſe them. None of them, however, go much farther than to prevent the colours from being ſhaken off by the concuſſion of carriages, or other accidents that may ſhake the place where they are hung. The ſame may be done by various eaſy means; as nothing more is required than to commix ſome tenacious body with the colours, either during the time of painting, or after they are laid on. The method hitherto moſt purſued, has been by ſpreading ſome fluid oil varniſh, ſuch as has been mentioned before for the preſervation of oil pictures, on the back of the cartoon, or paper, on which the crayon painting is made, after it is finiſhed. But this muſt be done with great care as to the proportion, otherwiſe the teints of the painting will be changed by ſome of them growing darker, in conſequence of their being rendered in a ſmall degree tranſparent. Another method is to lay ſuch a varniſh, or nut oil a little inſpiſſated by ſome of the ſame varniſhes, on that ſide of the cartoon, or paper, which is to be painted upon, before the painting be begun; which, when dry, will hold the colours in a very conſiderable manner. But the painting muſt, in this caſe, be finiſhed before the varniſh or oil grow dry, otherwiſe the intention will be defeated. By practice and experience either of theſe methods may be made to anſwer in a conſiderable degree.

CHAP. VIII.

Of mending and cleaning pictures and paintings.

SECT. I. *Of mending pictures.*

WHERE pictures have been torn, or parts of them deſtroyed, various methods have been uſed for repairing them, and making good the damaged or defective parts. But there is one ſimple method, by means of the oil fattened together with the colours in what is called by painters the ſmuſh-pot, or veſſel where they rub off the paint from the pencils, and put the ſcrapings of the palette, which, employed in the following manner, effectually anſwers the end, at leaſt equally well with the moſt complex and elaborate method.

Where pictures are only cut or torn without any loſs of their ſubſtance, they ſhould be laid on a flat even board or table. The torn or divided parts being carefully put together with ſome of the matter of the ſmuſh-pot laid as a cement, in and over the joint, they muſt be kept in that ſituation till this cement be thoroughly dry. The riſing or inequality of the cementing matter with the ſurface muſt then be taken off neatly by means of a pen-a penknife, and the part afterwards properly coloured to correſpond with the picture.

Where the cloth is worn out in parts, or deſtroyed by any accidents, the defective places may be eaſily made good by the following manner. Having laid the picture on a flat board, cut out with a penknife ſuch jagged or damaged pieces as cannot be brought to lie ſmooth and even. Then form a piece of canvas bigger than the whole intended to be covered, and plaiſter it over with the above-mentioned fat oil and colours taken from the ſmuſh-pot, on the outſide of the cloth, and fit it properly as a patch to the place it is to make good, taking care that the margin, or that part which projects on every ſide of the hole, have good hold of the canvas of the picture, and be preſſed cloſe every where to it. Then let it remain till it be thoroughly dry, and fill afterwards the inequality, or ſinking of that part of the picture where the patch lies, with the ſame matter from the ſmuſh-pot, raiſing it ſomewhat higher than the ſurface of the picture, to allow for the drying; and if it riſe too high, when dry, take it down with a penknife. After this is perfectly dry alſo, the part may be painted according to what the picture requires, and it will be found to be equally ſound and durable with any other part.

Where a picture is cut or torn into ſeveral pieces, the parts of it may be joined together and cemented down in the proper places on a piece of freſh canvas, by the ſame means.

SECT.

SECT. II.

Of cleaning pictures and paintings.

THE art of cleaning pictures and paintings is of great conſequence to the preſerving valuable works of that kind, but has been very little underſtood even by thoſe who profeſs to practiſe it. On this account many very valuable pictures have been damaged; and indeed few eſcape without damage, in a greater or leſs degree, which come under the hands of thoſe who pretend to make it their buſineſs, and yet moſt generally know no other than one ſingle way of treating all the ſubjects they are to operate upon, however different may be the condition or circumſtances of them.

As a painting may be, however, fouled with a variety of different kinds of matter, many of which will not be diſſolved, or ſuffer their texture to be deſtroyed by the ſame ſubſtances, it is neceſſary to know what will diſſolve or corrode each ſuch kind. For there is no other means of removing or taking off any foulneſs, than by diſſolving or corroding, by ſome proper menſtruum, the matter which conſtitutes it, except by actual violence, which the tender nature of oil paintings by no means ſuffers them to bear. Of theſe ſubſtances, which will remove, by diſſolving or corroding it, the matter which may foul paintings, ſome are very apt, likewiſe, to act upon and diſſolve the oil in the painting itſelf, and conſequently to diſorder or bring off the colours. While others are, on the contrary, paſſive and innocent, with reſpect to the painting, and may be uſed freely, or indeed in any quantity whatever, without the leaſt inconvenience of this kind.

As paintings to be cleaned are likewiſe varniſhed with a variety of ſubſtances of different natures, which ſometimes require to be taken off, and at other times are much better left remaining, it is very neceſſary to be able to judge what is beſt to be done in this point. It is likewiſe requiſite to know the means by which each ſort of varniſh may be taken off without injury to the painting. For in fact, without this, there is no way of cleaning pictures in ſome circumſtances, but by ſcouring till as well the ſurface of the picture as the foulneſs be cleared away. I ſhall therefore firſt give ſome account of the nature of the ſubſtances, which are, or may be uſed for cleaning paintings in oil, as it regards this application of them; and then ſhew how they may be uſed as well for the taking off the varniſh as the removing any foulneſs that may lie either upon or under it.

The firſt, and moſt general ſubſtance uſed for cleaning pictures, is water. This will remove many kinds of glutinous bodies, and foulneſs ariſing from them; ſuch as ſugar, honey, glue, and many others; and alſo take off any varniſh of gum Arabic, glair of eggs, or iſinglaſs, and is therefore the greateſt inſtrument in this work. It may be uſed without any caution with regard to the colours; as it will not in the leaſt affect the oil which holds them together.

Olive oil, or butter, though not applied to this purpoſe, through an ignorance of their efficacy, will remove many of thoſe ſpots or foulneſs which reſiſt even ſoap, as they will diſſolve or corrode pitch, reſin, and other bodies of a like kind, that otherwiſe require ſpirit of wine and oil of turpentine, which endanger the painting; and they may be uſed very freely, not having the leaſt effect on the oil of the painting.

Wood-aſhes, or what will better anſwer the purpoſe, when uſed in a proper proportion, pearl-aſhes, being melted in water, make a proper diſſolvent for moſt kinds of matter which foul paintings. But they muſt be uſed with great diſcretion, as they will touch or corrode the oil of the painting, if there be no varniſh of the gum reſins over it, ſo as to render the colours liable to be injured by very little rubbing. The uſe of them, or ſoap, is however, in many caſes, unavoidable; and in general they are the only ſubſtances employed for this purpoſe.

Soap is much of the ſame nature with the laſt-mentioned ſubſtances, being indeed only oil incorporated with ſalts of the ſame kinds, rendered more powerfully diſſolvent by means of quick-lime. For which reaſon it is ſomething more efficacious, but conſequently more hazardous, as it will the ſooner get hold of the oil of the paintings. It ſhould, therefore, not be uſed but on particular ſpots that elude all other methods, and there with great caution.

Spirit of wine, as it will diſſolve all the gums and gum reſins, except gum Arabic, is very neceſſary for the taking off from pictures varniſhes compoſed of ſuch ſubſtances; but it corrodes alſo the oils of the paintings, and ſoftens them in ſuch manner as makes all rubbing dangerous while they are under its influence.

Oil of turpentine will likewiſe diſſolve ſome of the gums uſed for varniſh; but ſpirit of wine will in general much better anſwer that purpoſe. There are, however, ſometimes ſpots of foulneſs, which will give way to ſpirit of turpentine, that reſiſt moſt other ſubſtances uſed in this intention, and it may therefore be tried where they appear to fail, but very ſparingly and with great caution, as it will very ſoon act even on the dry oil of the painting.

Eſſence of lemons has the ſame powers as oil of turpentine; but is, moreover, a much ſtronger diſſolvent, and ſhould, therefore, only be uſed in deſperate caſes, where ſpots ſeem indelible with regard to all other methods. Spirit of lavender and roſemary, and other eſſential oils, have the ſame diſſolving qualities as eſſence of lemons; but they are in general dearer, and ſome of them too powerful to be truſted near the colours.

Whenever paintings are varniſhed with gum Arabic, glair of eggs, or iſinglaſs, the varniſh ſhould be taken off when they are to be cleaned. This may be eaſily diſtinguiſhed by wetting any part of the painting, which will feel clammy if varniſhed with any ſubſtance diſſolvable in water. In ſuch caſes, the taking off the varniſh will frequently alone render the painting intirely clean; for if it has been laid on thick, and covered the ſurface every where, the foulneſs muſt neceſſarily lie upon it. The manner of taking off this kind of varniſh muſt be done by means of hot water and a ſponge, the picture or painting being laid horizontally. The water may be near boiling hot, and may be uſed copiouſly at firſt with the ſponge; but when the varniſh appears to be ſoftened, and the painting more naked, it ſhould be uſed cooler. If the varniſh adhere ſo as not to be eaſily brought off by a ſponge, a gentle rubbing with a linen cloth may be uſed, the cloth being frequently wrung and wet again with freſh water a little warmiſh.

Where paintings appear by the above trial to be varniſhed with the gum reſins, or ſuch ſubſtances as cannot be diſſolved in water, it is proper, nevertheleſs, to waſh them well with water pretty warm by means of a ſponge, which will ſometimes be alone ſufficient to clean them even in this caſe. But if there yet appear any foulneſs, rub the painting over with olive oil made warm, or butter; and if any parts appear ſmeary, or any foulneſs ſeem to mix with the oil or butter, purſue the rubbing gently, taking off the foul oil, and adding freſh till all ſuch foulneſs be wholly removed. Let the oil be then wiped off with a woollen cloth, and if the picture require further cleaning, the wood-aſhes, or pearl-aſhes, muſt be uſed in the following manner; which, indeed, as to the firſt part, is not widely different from the method commonly uſed.

"Take an ounce of pearl-aſhes, and diſ-
"ſolve them in a pint of water, or take two
"pounds of wood-aſhes, and add to them
"three quarts of water, and ſtir them well
"in the water once or twice in an hour for
"half a day. Then, when the earthy part
"of the aſhes has ſubſided, pour off the clear
"fluid, and evaporate it to a quart, or if it
"appear acrid to the taſte at that time, three
"pints may be left. Waſh, by means of
"ſponge, the painting well with either of
"theſe ſolutions, or lyes (which are in fact
"the ſame thing) made warm, and rub any
"particular ſpots of foulneſs gently with a
"linen cloth till they diſappear; but if
"they are found to remain unchanged by the
"lye, do not endeavour to take them off by
"mere force of rubbing, for that would in-
"fallibly damage the colours under the ſpots
"before they could be removed; for in this
"caſe they ſhould be left to be tried by the

" ſpirit of wine, or the eſſential oils of turpen-
" tine and lemons. Where thick ſpots ſeem
" to give way in part, but yet reſiſt in a great
" degree to this lye, a little ſtrong ſoap-ſuds
" may in ſome caſes be uſed, if with great
" caution. But it ſhould be prevented as
" much as poſſible from touching any part
" of the painting, except the ſpot itſelf; and,
" as that diſappears, the ſoap ſhould be di-
" luted with water, that it may not reach the
" oil of the colours in its full ſtrength. If,
" however, all this be done upon a ſtrong
" coat of varniſh, there will be leſs hazard;
" and, in ſuch caſes, the waſhing freely with
" the wood-aſh lye, or weak ſoap-ſuds, will
" frequently do the buſineſs effectually with-
" out any material damage. But it requires
" ſome judgment to know where paintings
" may be ſo freely treated; and, with reſpect
" to thoſe of great value, it is always beſt to
" proceed by more circumſpect methods,
" and to try the more ſecure means I have
" above directed, before theſe rougher be
" uſed."

Some uſe the wood-aſhes with the addition of water only, without ſeparating the ſolution of the ſalts from the earth; which, when ſo uſed, aſſiſts in rubbing off the foulneſs from the painting. But all ſuch practices are to be condemned, as the finer touches of the painting are always damaged in a greater or leſs degree where any abraiding force is employed in cleaning it.

Where ſpots appear after the uſe of all the above-mentioned methods, ſpirit of wine, or, if that fail, oil of turpentine, and in the further caſe of its default, eſſence of lemons muſt be applied. The ſpots ſhould be lightly moiſtened with them, avoiding to ſuffer them to touch any more of the ſurface than what is covered with the foulneſs, and the part ſhould be immediately rubbed with a linen cloth, but very gently, obſerving at the ſame time to deſiſt if the colours appear the leaſt affected. After a little rubbing, olive oil ſhould be put on the ſpot where oil of turpentine and eſſence of lemons are uſed, and water where ſpirit of wine is applied, which being taken off by a woollen cloth, if the foulneſs be not wholly removed, but appears to give way, the operation muſt be repeated till it be intirely removed.

Where paintings appear to have been varniſhed with thoſe ſubſtances that will not diſſolve in water, and after the careful uſe of the above means ſtill to retain the foulneſs, or where, as is very often found, the turbidneſs, or want of tranſparency, or the yellow colour of the varniſh deprave the painting ſo as to deſtroy its value, ſuch varniſh muſt be taken off. The doing of this, though attended with the greateſt difficulty to thoſe who proceed by the methods now in uſe, and which indeed is ſeldom done by them at all, but with the deſtruction of the more delicate teints and touches of the painting, is yet very eaſily and ſafely practicable by the following method.

“ Place the picture or painting in an horizontal ſituation, and moiſten, or rather “ flood, by means of a ſponge, the ſurface “ with very ſtrong rectified ſpirit of wine; “ but all rubbing, more than is neceſſary to “ ſpread the ſpirit over the whole ſurface, muſt “ be avoided. Keep the painting thus moiſtened, by adding freſh quantities of the “ ſpirit for ſome minutes; then flood the “ whole ſurface copiouſly with cold water, “ with which likewiſe the ſpirit and ſuch “ part of the varniſh as it has diſſolved “ may be waſhed off. But in this ſtate of “ it, all rubbing, and the ſlighteſt violence “ on the ſurface of the painting, would be “ very detrimental. When the painting is “ dry, this operation muſt be repeated at diſcretion till the whole of the varniſh be “ taken off.”

In pictures and paintings which have been long varniſhed, it will be found ſometimes that the varniſh has been a compoſition of linſeed oil, or ſome other ſubſtantial oil, with gums and reſins. If ſuch paintings cannot be brought to a tolerable ſtate by any of the above-mentioned means, which may in this caſe be freely uſed, the miſchief may be deemed to be without remedy; for it is abſolutely impracticable to take off ſuch a varniſh, as it is more compact and indiſſoluble than the oil of the painting itſelf, and could only be wrought upon by thoſe menſtrua and diſſolvents which would act more forcibly on the paintings. Such pictures muſt, therefore, be left in the ſtate they are found, except by being freed from any foulneſs that may lie upon this varniſh, and may be cleared away by the methods we have before directed. The coat of this varniſh may indeed be ſometimes made thinner, by anointing the ſurface of the painting with eſſence of lemons, and then putting on olive oil, which, when rubbed off by a ſoft woollen cloth, will carry away the eſſence with ſuch part of the varniſh as it may have diſſolved. But this requires great nicety, and can never be practiſed without ſome hazard of diſordering the colours of the painting.

CHAP. IX.

Of the nature, preparation, and uſe of the ſeveral ſubſtances employed in ENCAUSTIC painting.

SECT. I. *Of the general nature of encauſtic painting.*

THE manner of painting called at preſent ENCAUSTIC, differs from all others in this particular, that *wax* is always employed in it as a binder to the colours, being united with them by means of heat applied in ſuch a degree as will melt it.

The name of *encauſtic* was given to this method of painting, on the ſuppoſition of its being the ſame with that practiſed by the ancients, when they are ſaid *encauſto pingore*; and there is ſome foundation from ſeveral paſſages in Pliny for ſuch a notion.

This manner of painting has been lately attempted by ſeveral methods. In that firſt adopted, the wax was mixed with oil of turpentine, and ſometimes other ingredients, and the compoſition was uſed as a vehicle for laying on the colours. This method appeared of very little uſe, and experience has ſince ſhewn that it anſwered the purpoſe much better, either to lay the wax on the ground, and paint upon it afterwards with the colours in water, or to lay the wax on the back of the cloth or cartoon, either before or after the painting was made on it. In all theſe methods, after the painting is made, the picture is to be expoſed to ſuch a degree of heat as will melt the wax, that it may be diffuſed through all the particles of the colours, and bind them to the ground as well as ſecure them from the acceſs of air or moiſture. The laſt method has been applied as well to paintings with crayons as with water, but the crayons muſt be accommodated in their compoſition to this purpoſe.

Many advantages and conveniences, as well with regard to the eaſy practice as durability, have been aſcribed to this method of painting by thoſe who are favourers of it. But it has not yet prevailed in common practice, partly from the backwardneſs profeſſors of arts of this kind have to take the pains, or loſe the time neceſſary to gain a facility or perfection in the execution of new methods, and partly from the increaſed difficulties and trouble ariſing from ſeveral circumſtances of finiſhing a picture completely in this way.

SECT. II.

Of the grounds uſed in encauſtic painting.

THE grounds uſed for encauſtic painting have been very different, and indeed ſhould be ſo for different purpoſes. They have had for their baſis, *canvas*, *linen cloth*, *paper*, *plaiſter*, and *wood*, and almoſt all theſe have been differently prepared.

According to the method of Count Caylas, who firſt introduced this manner of painting, the cloth, or wood, which were the ſubſtances he made the baſis of his grounds, were to be ſimply rubbed over with a piece of bees wax, the ſurface of the cloth or wood being either in a perpendicular or horizontal ſituation, near a fire that would melt the wax ſo as to make it adhere; if the caſe of cloth, it was previouſly fixed to a proper ſtraining frame; but when he uſed colours, on this ground, that were tempered with water, it was found neceſſary, in order to make them adhere ſufficiently till the picture was finiſhed, and the wax expoſed to the melting heat, to rub the whole waxed ground over with Spaniſh chalk or whiting.

According to the method directed by Mr. Muntz, who has written a treatiſe on this manner of painting ſince that publiſhed by Count Caylas, and who appears to have rendered it more practicable by the improvements he has made, the ground, when the painting is on cloth, is to be thus prepared.

" Take any kind of linen cloth, which is
" of a cloſe texture, ſoft, and even, and ex-
" tend it on a ſtraining frame, as is done
" in the caſe of cloths uſed for oil painting.
" Lay it on a ſmooth table, with that ſide
" downwards on which the colours are to be
" laid. Let it be then rubbed ſeveral times
" over with a piece of common bees wax,
" or virgins wax, till it appear that the cloth
" be equally covered with a coat of wax
" of a conſiderable thickneſs. If the linen
" be fine, this is all that is requiſite to prepare
" it for being painted upon; but if it is coarſe,
" it muſt be turned with the ſide uppermoſt

"that is to receive the colours; or, in other "words, the reverſe of the waxed ſide, and "the ſurface muſt be well, but gently, rubbed with a pumice-ſtone, to take off all "the knots and unevenneſs, which might "prevent the free and accurate working of "the pencil. In the preparation of a cloth "for this kind of painting, regard muſt be "had to the preventing any of the waxed "part of it from touching the ſtraining "frame when the picture is finiſhed. In "order to this, the cloth, when the wax is "laid on, ſhould be ſtrained on a frame of "the magnitude of which the picture is intended to be; and ſo much cloth ſhould "be left beyond the outward edge as will be "ſufficient to ſtrain it on a larger frame, that "will admit the waxed part to be a little "within its inner edges after the picture is "finiſhed. If this be not done, the wood "touching the wax, at the time it is melted, "would imbibe a part of it; and conſequently "robbing the colours, render ſo much of the "picture imperfect."

This method can, nevertheleſs, only be applied to cloth or paper, where the wax can paſs through the ſubſtance. Therefore, in the caſe of wood, ſtone, metal, or plaiſter, the former method of Count Caylas muſt be adhered to. It ſucceeds, indeed, extremely well with regard to plaiſter, on account of the gritty or rough ſubſtance; only, in this caſe, the dead colouring muſt be painted firſt, and the colours fixed by melting the wax before the finiſhing be begun; and then either chalk muſt be uſed, as at firſt, to make the colours adhere, or the colours themſelves muſt be tempered with oil of turpentine and a little wax. When wood, ſtone, or metals are uſed, this roughneſs of ſurface being wanting, it muſt be ſupplied artificially, by laying a ground of equal parts of chalk and wax, and fixing them; and then the painting may be performed as well as upon cloth. When paper is uſed, it requires the aid of a ſmooth board, or a plate of copper, or ſome other metal. This board, or plate, muſt be firſt well coated with wax, in the ſame manner as was above directed for the cloth; and then the paper muſt be faſtened upon it by the corners. Paper thus prepared may be painted upon by colours tempered in water, and, when the picture is finiſhed, they may be fixed by melting the wax as in the foregoing caſes. The ſame may be done with cloth and a board, or a plate of metal, where that may be thought more convenient than waxing the back of the cloth.

In the caſe of crayons, there are two methods of forming grounds propoſed by Mr. Muntz. The one is with cloth without paper. The other with cloth covered with paper. The firſt is in this manner.

" Take any kind of linen cloth, of which
" the texture is cloſe and even, and ſtretch it
" on a ſtraining frame. Rub the back of
" it

" it with a piece of bees wax, uſing heat, as " in the manner above directed. The cloth " being thus waxed, prepare any teint or " colour, that is thought beſt to work upon, " by mixing ſome proper pigment with an " equal quantity of chalk, and tempering them " with water. With this compoſition, paint " over the cloth on the ſide that is to be the " ground of the picture, or, in other words, " the reverſe of the waxed ſide, laying an even " and thick coat of the colour proper for the " ground. When this colour is dry, bring " the picture near the fire, as in the other be- " fore-mentioned caſes, and melt the wax; " which will then paſs through the cloth and " fix the ground. This, when cool, will be " found a very firm and good body to work " upon with the crayons. If, however, it " ſhould happen that the quantity of wax " ſhould not be ſufficient for the body of the co- " lour, a freſh quantity muſt be ſupplied by " another coat on the reverſe or back; but " as this muſt be laid on without heat, the " wax ſhould be diſſolved in oil of turpentine, " and applied with a bruſh as directed below, " and the canvas muſt afterwards be again " expoſed to ſuch heat as will melt the wax, " that this freſh quantity may paſs through " the cloth, and be abſorbed by the colour. " This muſt be cautiouſly managed, as it is " of great importance in crayon painting to " have the ground in good order to receive " the colours of the paſtils."

The other method of forming a ground for crayons in this manner of painting, that is, where cloth and paper are joined together, is thus performed.

" Take linen cloth, and ſtretch it upon a " ſtraining frame in the manner above di- " rected. Make then a paſte with fine " wheaten flour, or ſtarch and water. When " the paſte is almoſt ſufficiently boiled, add " to it, of common turpentine, ſuch a quan- " tity, as will be, in proportion to the paſte, " about a twelfth part of the weight. Stir " the compoſition well together, and let it " ſimmer over the fire five or ſix minutes. " Take it then off the fire, and let it ſtand to " cool a little. After which, before it be " quite cold, paſte the paper to the cloth " with it in the common method, and " leave them to dry. In the mean-time, " diſſolve ſome wax in oil of turpentine, by " adding the wax in ſhavings to the oil, " and placing the mixture near a fire. The " proportion of the one to the other muſt " be ſuch, that the compoſition, when cold, " will be of the conſiſtence of a thin paſte, " but yet ſo fluid as to admit of being ſpread " by a bruſh. The cloth and paper being " perfectly dry, hold them over, or before " a fire, at a convenient diſtance; and, " with a bruſh, lay a coat of the wax and tur- " pentine on both ſides the conjoined cloth " and paper, in ſuch a degree of thickneſs " that both ſurfaces may ſhine in every part, "without the appearance of any dull ſpots. "This being done, place the cloth before "the fire for about half an hour, or, if in "ſummer, expoſe it to the ſun. By this means "the oil of turpentine evaporating, the wax "will become ſolid again, and be fit to receive any compoſition of colour for a ground "to paint upon; which ground muſt be laid "on and fixt, according to the directions "above given in the caſe of cloth without "paper."

Theſe are the grounds which have been uſed for all the ſeveral methods hitherto invented and communicated to the public. The greateſt part of them are not merely grounds to receive the painting, but previous depoſits of the wax on the cloth, paper, &c. in order to its being commixt with the colour, by means of a melting heat, when the picture is finiſhed; as, according to ſeveral of the methods, the wax could not be conveyed to them afterwards.

SECT. II.

Of the colours to be uſed in encauſtic painting.

ALMOST every colour admitted in oil painting may be uſed in the encauſtic method, as practiſed in Mr. Muntz's manner, except ſome few, that by their gummy or ſtony texture will not ſuffer ſuch a coheſion with the wax as will properly fix them. In this light, Mr. Muntz excepts to brown, and light pink, and unburnt *terra di Sienna*. But, beſides thoſe, which may be truſted with ſafety in oil, there are ſome which may be allowed here, that cannot be admitted in oil painting. Theſe are, red lead, red orpiment, cryſtals of verdigriſe, and red precipitate of mercury; which, on account of their brightneſs, are very advantageous where they can be uſed. In ſhort, whatever colours are of ſuch texture that they may be uſed commodiouſly, and with good effect, in relation to the painting, may have a place here; as the wax, incloſing every particle of them, and conſequently preventing all acceſs of air and moiſture to them, renders them perfectly durable. The colours which diſſolve in water, or when ground in it, ſuffer a coheſion of their particles, and grow hard on again becoming dry, or palpably unfit, as they reſiſt the imbibing the wax and its commixture with them. Excluding all theſe, there is, nevertheleſs, a great latitude of choice, and, indeed, in a very ample proviſion of colours, even of the firſt degree of brightneſs, which this manner of painting allows, a very great part of its merit conſiſts.

As many of the colours grow deeper on their being fixed with the wax than they were before, or even than when they are moiſtened with water, allowance muſt be made in the painting for ſuch change. In order to facilitate this, Mr. Muntz has propoſed the expedient of making a ſtandard, or regulator, in the following manner.

"Take two pieces of linen cloth, of about " a foot in length, and three or four inches " in width, and wax them as above directed. " On one of them paint all the ſimple colours " on the unwaxed ſide in ſucceſſive ſpaces " lengthwiſe, of about an inch each in " breadth. On the other piece, paint the " compound teints; and mark them with " numbers according to their order and gra- " dation; making a memorandum in writing " on a piece of paper of what ſimple colours, " and the reſpective proportions each teint is " formed. When the colours are dry, cut " the cloths lengthwiſe into two equal parts, " and fix the colours on one part of each of " them, by expoſing it to the proper degree " of heat, for melting the wax, in the man- " ner below directed. By comparing the " pieces where the colours are fixt with thoſe " where they are unfixt, the difference will " of courſe appear, which the wax produces " on the colours; and by this ſtandard of it, " due allowance may be made, in the uſing " the colours, for the change that is to hap- " pen after the fixing."

It is a great advantage to the effect, to uſe a great body of colour, which not only renders the teint ſtronger and brighter, but prevents

vents their varying unequally after fixing, from the undue commixture of the wax with the colours.

The colours are to be ground very fine in water, and then preſerved of a due degree of moiſtneſs for painting by water only. For no other vehicle is to be added; as gum, ſize, or any other ſubſtance that would give cohesion to the particles of the colours, would prevent the wax from commixing duly with them. This excluſion of any unctuous or ſizy vehicle is one of the greateſt diſadvantages attending this method of painting. For, though Mr. Muntz ſays, *you may give greater freedom to the pencil, and blend and ſweeten the colours better in this way of painting than any other*, yet it is obvious, that many of the colours will not work kindly in water, nor indeed any, but ſuch as commix intimately with it, and thicken the water by their own ſubſtance; and theſe coaleſcing again, when dry, refuſe the admiſſion of the wax, and are therefore exceptionable, as was before mentioned.

In order to retouch any larger parts of the painting, which may require it, after the colours are dry, this method muſt be practiſed.

"Take a large ſoft hair pencil, and moiſten gently with water thoſe places which
" are to be repainted; and then what is ne-
" ceſſary may be done, as well as when the
" colours were originally wet. But great care
" muſt be obſerved not to uſe ſo much vio-

" lence as may ruffle or diſplace the colours, " which are very looſe in this ſtate, as they have " no glutinous vehicle to bind and fix them. " In larger pictures, where the cloth is ſtronger, " the colours may be moiſtened by bruſhing " the backſide of them with water, which, " notwithſtanding the wax, will find its way " through. But this muſt be done gradually " and ſparingly as to the quantity of water, " or otherwiſe the colours may be rendered " too wet, and the painting diſordered. In " very delicate paintings, the uſe of the ſteam " of water is ſafer than the bruſh, care being " taken to keep the painting ſo far diſtant " from the heat of the water as not to melt " the wax."

SECT. III.

Of the manner of fixing the colours in the practice of painting in encauſtic.

THE picture being finiſhed, and the colours dry, prepare a clear coal fire, and ſet the picture with the painted ſide towards it, at about two feet diſtant from this fire. Let it grow warm, and then by degrees bring it cloſer to the fire, till it be only one foot diſtant, but never advance it nearer. The picture may be held perpendicularly, or a little inclined, as may be found moſt convenient; and when it is too large to receive the effect of the heat at once, firſt one part, and then the other, may be brought parallel to the fire at the diſtance preſcribed. When no farther change appears to be made in the picture, but that the whole ſurface is ſhining, and the colours rendered darker and fuller in an equal degree, it may be concluded the wax is ſufficiently melted, and duly abſorbed by the colours. The picture muſt then be removed from the fire in the ſame gradual manner it was made to approach it, and kept from any rude touch till the wax be entirely ſet and grown hard.

If there be found any defective parts where the wax has not undergone the due degree of heat required to melt it, ſuch parts muſt be perfected, by bringing a red-hot poker, or other ſuch metallic body near them. But if there ſtill appear any ſpots, where, after the duly melting the wax to commix it with the colours, a deficience of it is yet ſeen, ſuch ſpots ſhew a defect in the quantity of wax, and the deficiency muſt be ſupplied by rubbing a proper quantity on the back, and melting it by means of the hot poker, or other proper implement of metal in the ſame manner.

SECT. IV.

Of the manner of painting with crayons in encauſtic.

THE paſtils, or crayons, uſed in encauſtic painting, may be the ſame with thoſe uſed in the common way of crayon painting, except that ſuch as are too tenacious, in conſequence of an over great proportion of any clayey body, or of any gummous or ſizy ſubſtance, added to bind the colour, muſt be rejected. The beſt method, however, of diſtinguiſhing ſuch crayons as are fit for encauſtic painting, from ſuch as are faulty with regard to it, is to make an actual trial of them on the proper ground prepared as above, and to fix them afterwards by heat, as before directed, by which means, with very little trouble, the imperfection, if there be any, will be immediately perceived in the real degree. When it is found that any crayons, which ſeem faulty in their texture, are nevertheleſs wanted on account of their colour to produce any particular teint, a proper variation muſt be made in the compoſition of them, and leſs of the clay or viſcid matter added to give the tenacity muſt be uſed. If the trial of the crayons be made on the proper ground in the manner before directed, p. 251, 252, for the encauſtic painting with the pencil, a complete ſtandard will be produced, for ſhewing the difference of the teints, before and after they are fixed, which is not leſs neceſſary in this kind of encauſtic painting than in the other.

The manner of uſing the crayons in the encauſtic way of painting is the ſame as in the common method of crayon painting, the difference of the one from the other lying only in the preparation of the ground;—the choice of crayons of a fit texture to receive the wax, as above-mentioned;—and the fixing the crayons after the painting is finiſhed, by means of melting the wax, previouſly laid on the cloth, or ground, as in other encauſtic painting.

The fixing the crayons may be performed exactly in the ſame manner as is directed page 257, in the caſe of encauſtic painting with the pencil, the principles of both being intirely the ſame. If, moreover, there appear to be occaſion to retouch after the fixing, it may be done as often as required, and wax diſſolved in oil of turpentine may be each time applied to the back, and the picture again expoſed to the due degree of heat, as in the other methods.

CHAP. X.

Of the nature, preparation, and uſe of the ſeveral ſubſtances employed in enamel painting.

SECT. I. *Of the general nature of enamel painting.*

ENAMEL painting differs from all other kinds, in the vehicle employed for the colours, (to hold the parts together, and bind them to the ground they are laid upon.) This is glaſs, or ſome vitreous body, which being mixt with the colours, and fuſed or melted, by means of heat, becomes fluid, and having incorporated with the colours in that ſtate, forms, together with them, a hard maſs when grown cold. It anſwers, therefore, the ſame end in this, as oil, gum water, ſize, or varniſh, in the other kinds of painting.

The glaſs, or vitreous body, applied to this purpoſe of mixing with the colours, in order to bind them to the grounds, is called a *flux*, and makes one principal claſs of the ſubſtances uſed in enamel painting. When this flux is eaſily fuſible, that is to ſay, melts with a leſs degree of heat, it is, in the ſtyle of thoſe who work in enamel, ſaid to be *SOFT*, and when it is reluctant to melt, and requires a greater degree of heat, it is called *HARD*. Theſe terms are as well applied to the matter of the enamel grounds, and all other vitreous ſubſtances concerned, as to the fluxes. It is, in general, a perfection of the flux to be ſoft, or run eaſily into fuſion. But the great point, with reſpect to this particular, is, that when ſeveral mixtures of colours and fluxes are uſed at the ſame time, they ſhould all correſpond to each other in the degree of this quality; otherwiſe, ſome would be rendered too fluid, and perhaps run the matter of the enamel-ground into fuſion, and mix with it, while others remained ſolid and inſufficiently fuſed themſelves. It is always neceſſary, likewiſe, that the enamel of the ground ſhould be conſiderably harder than the mixtures for the colours, for if they both melt with the ſame degree of heat, they will neceſſarily run together.

It being requiſite that the body painted in enamel ſhould undergo a heat ſufficient to melt *ſoft* glaſs, the matter of ſuch body can only be gold, ſilver, copper, porcelain, or China ware, *hard* glaſs, and earthen-ware. And where the metals are uſed, if the painting be of the nature of a picture, or demand a variety of colours, it is neceſſary that a ground of white, or ſome other colour ſhould be laid on the metal, the body of which ground muſt neceſſarily be of the ſame vitreous nature as the flux, but harder; as nothing elſe can endure ſo great a heat that is capable of incorporating with, and binding the matter of the white, or other colour, to the ſurface of the metal. The grounds, therefore, make another principal claſs of the ſubſtances uſed in enamel painting.

The third claſs is the colours, which muſt likewiſe be bodies capable of ſuffering the heat of melted glaſs, and ſuch as will either themſelves be converted into glaſs, or kindly incorporate with it in a melted ſtate. This of courſe confines the matter of ſuch colours to metals, earths, or other mineral bodies, all vegetable and animal ſubſtances being calcined and analized with a greatly leſs degree of heat than the loweſt ſufficient to work enamel.

The fourth kind of ſubſtance is what I ſhall call *the ſecondary vehicle*, which is, ſome fluid body for laying on the ground, and working with the pencil the flux and colours when mixt together; ſince, as they form only a dry powder, they could not be uſed as paint without ſome ſuch medium. But as this is to ſerve only for ſpreading and laying on the matter of the enamel, and not, like other vehicles, to aſſiſt in holding the colours together, and binding them to the ground, (that being in this kind of painting the office of the flux) it is neceſſary that it ſhould be ſome ſuch ſubſtance as will evaporate and dry away without leaving any part behind, as it would otherwiſe be heterogeneous matter, with regard to the enamel, and conſequently injurious to it. Eſſential oils have been therefore uſed for this purpoſe, as they have the quality of wholly drying away on the firſt approach of heat, together with a ſlight unctuoſity, which renders them capable of making the matter of the enamel work properly with the pencil.

The preparation of theſe ſeveral ſubſtances have been, till late, greatly monopolized by the Venetians, except what were prepared at Dreſden ſince the eſtabliſhment of the China manufactures. The few others who have had any knowledge of this matter, have practiſed the preparing only ſome kinds; and even at preſent there are, perhaps, none in this country who make more than a ſmall part of the variety neceſſary. For though many poſſeſs the knowledge of ſome particular articles, yet they are ignorant with regard to others, which are again, perhaps, known to thoſe who are ignorant of theſe. As there has been hitherto no means afforded to the practiſers of it of learning the particulars of this art in a ſyſtem, and a deeper knowledge of the principles and practice of chymiſtry *is* requiſite to the attaining it, without being taught, than could well fall to the ſhare of painters, or other artiſts; I ſhall, therefore, be more minute in my inſtructions for the making the ſeveral kinds of the grounds, fluxes, and colours, in order that they who are concerned in, or may be deſirous to apply themſelves to the art of painting in enamel, which is now become the baſis of a conſiderable manufacture in this country, may furniſh themſelves with whatever is neceſſary in its greateſt perfection.

Beſides the knowledge of the preparation of the above ſubſtances, and of that part of the art of uſing them, which belongs to painting in general, there is another requiſite. This is the *burning*, as it is called, the grounds, in order to forming them on the body to be painted, or enamelled; as alſo the colours with the fluxes after they are laid on the grounds. What is meant by *BURNING*, is the giving ſuch a heat to the matter, when laid on the body to be painted, as will fuſe or melt it, and conſequently give to the flux or vitreous part of the compoſition the proper qualities of a vehicle for binding the colours to the ground, and holding the parts together. As this requires a particular apparatus, I ſhall endeavour to ſhew the method of conſtructing it in the moſt expedite and eaſy manner; and to give ſuch cautions for the conduct of the operation, both for burning the grounds and painting, as may beſt enable thoſe, who are leſs experienced in it, to attain to perfection in this art. It cannot be expected, nevertheleſs, conſidering the nicety of the ſubject, ſuch directions can be given as will inſure ſucceſs in the firſt trials, with regard to ſeveral of the proceſſes, or even the general operations; but whoever will make themſelves maſters of the principles on which they depend, which are all along intimated, will eaſily be able to correct their own errors.

A judgment, formed by ſome little experience, is likewiſe requiſite for the preparing well the colours with certainty. For as different parcels of the ſame ſubſtance vary frequently in their qualities, with regard to the degree or proportion, it is neceſſary to make allowance accordingly in the proportion of the quantities in the mixtures. This cannot be done till ſome little previous trial be made, and the power of judging of them be gained by an experimental acquaintance with them. But as the materials in general are very cheap, and the experiments may be made in the ſame fire where actual buſineſs is done, whoever would excel in the art of preparing and uſing enamels ſhould *take a conſiderable* ſcope of experimental enquiry into the effect of all the various proportions and commixtures of the ſubſtances uſed.

SECT. II.

Of the apparatus, or ſet of utenſils for the preparing and laying on the grounds and colours in enamel painting.

THE apparatus neceſſary for preparing and uſing the ſeveral ſubſtances employed in enamel painting, conſiſts of a furnace for calcining and fuſing the matter of which the colour is compoſed; as alſo for burning or fuſing the grounds and colours after they are laid on;—of proper muffles or coffins for ſecuring the enamelled paintings from the injury of the fire while they are burning;—of pots for fuſing the compoſitions for colours and fluxes, or the mixtures of them together;—of crucibles for calcining copper and other metals, in order to the preparing the colours;—of mortars of glaſs, agate, or flint, or of ſtones, and mullars for porphyry or flint, for the pounding and levigating the ſeveral kinds of matter;—of tongs for taking the pots, muffles, &c. out of the fire;—of bruſhes, pencils, and a fine ſearce or ſieve.

The furnaces for burning enamel are conſtructed of very various ſize or figure, according to the nature and qualities of the work; and ſome are made to be heated with common coal, and others with charcoal, but at preſent not frequently. The beſt form for a furnace for enamelling pictures, or other pieces of the ſame magnitude, where the diſpatch of great numbers are not wanted, is the following, which is made to work with a fixt muffle, in or out of which the work may be put or taken without opening the door of the furnace, and annoying the operator with the heat; who, for the ſame reaſon, likewiſe may conveniently inſpect the work in the muffle.

The iron-work muſt be firſt prepared. It conſiſts of a frame and bars, ſuch as is deſcribed in p. 16, the area of which together muſt be ten inches by ſeven;—of a door and frame, ſuch alſo as is deſcribed in p. 16, which muſt be five inches high, and ſeven long;—and of a plate or ſtrong bar to lay over the opening of the front, as below directed, which muſt be ten inches long; with another of the ſame magnitude to lay over the door and frame; and one of eight inches to lay over the vent into the chimney;—and of a frame for bearing the fixt muffle. This frame muſt ſuit the figure of the muffle; except, that it muſt be only three inches in depth, with the back part open, for the muffle to paſs through it into the cavity of the furnace; and that the plate which forms the bottom muſt project an inch and an half on each ſide, beyond the arch or covering, for the brick-work to have good hold of it. But this will be better underſtood by conſidering the form of this kind of muffle, as below deſcribed.

The iron-work being prepared, let a chimney of twelve or fourteen feet height be raiſed; the cavity of which muſt be an area of ſeven or eight inches ſquare, in the front wall of which chimney a hole muſt be left for admitting the ſmoke of the furnace. The hole muſt be ſo placed that the lower part may be five feet above the foundation of the chimney; and it may be four inches high, and ſix long; the plate prepared for this purpoſe being

ing laid over to ſupport the brick-work above it.

The chimney being raiſed to a proper height, let a pedeſtal or foundation to the furnace be built, by adding two walls to thoſe of the chimney, ſo as to incloſe an area fifteen inches in depth from the front, and eight inches wide; the front being left open from the default of a fourth wall. This pedeſtal muſt be raiſed four feet and a half high; and then the frame and bars for ſupporting the fuel, with their croſs-bars, muſt be laid; the furthermoſt croſs-bar being laid cloſe to the back of the hollow area; or, in other words, to the wall of the chimney. The plate or flat-bar muſt be alſo laid cloſe to the outermoſt croſs-bar of thoſe for bearing the fuel, in order that the brick-work may be carried over the hollow area, and incloſe the ſquare cavity of the furnace entirely. The brick-work muſt be then raiſed ſix inches higher, in the ſame manner as before; only the front muſt now be carried up, as well as the ſides; which, together with the wall of the chimney, forms a complete incloſed area for holding the fuel. But particular care muſt be taken in laying the firſt courſe of this brick-work, that the flat ends of the croſs-bars, in which thoſe deſigned to bear the fuel are faſtened, be well ſecured by the bricks which lie over them. When the cavity for holding the fuel is thus formed, the door and frame muſt be placed in their proper ſituation, and the brick-work muſt be carried up on the two ſides to the level of the top of the frame; but, in the ſide moſt conveniently ſituated, the iron frame for bearing the muffle muſt be fixed in the raiſing this part of the brick-work. This frame muſt be placed about four inches higher than the bottom of the door, and two inches from the back or furthermoſt part of the furnace; care being taken that the brick-work have good hold of the parts of the frame formed for that purpoſe. The bricks contiguous to the frame ſhould be properly ſloped to the hole formed by it, that the opening into the muffle may be wider and more commodious for the taking out and putting in the work to be burnt, as alſo for the more eaſy inſpection of it while burning. The brick-work being brought to a level with the top of the frame of the door, the plate or flat iron bar provided for that purpoſe muſt be laid over it, in order to ſupport the building over it. The ſides of the furnace muſt then be raiſed five inches higher, and the cavity or hollow covered with a dome of fire-ſtone, made a little concave on the inner or under ſide, and of any figure the ſtone will beſt admit on, the outward or upper. This dome muſt reſt on the brick-work, and they ſhould be ſo fitted to each other as to make as cloſe a joint as poſſible; ſo that a coat of fire-lute being laid on the bricks when the dome is put on, the furnace may be perfectly tight. Windſor bricks ſhould be employed for all that part of the furnace which is above the bars for bearing the fuel, and they ſhould be laid in Windſor loam.

Where greater quantities of pieces are to be enamelled, and diſpatch is required, furnaces muſt be built in the manner proper for containing coffins inſtead of a muffle; for the conſtructing which the following is a very good method.

This furnace muſt be built till the fabric riſe within two inches of the top of the door, in the ſame manner as the former, except with regard to the dimenſions, and the adding a back wall againſt that of the chimney, which muſt be eight inches in breadth, and twenty inches in length. The dimenſions of the cavity of the chimney, till it riſe to the height of five feet ten inches, muſt be twelve inches in breadth, and ſeven or eight inches in depth, from the front: and the hollow or area under the bars for bearing the fuel muſt be eleven inches and a half deep from the back wall to the front, and twelve inches wide; and that of the furnace where the fuel is to lie, eight inches in depth from the front wall to the back wall, and twelve inches in breadth; to which dimenſions the bars and croſs-bars muſt be ſuited. The building being carried up to the height here mentioned, a door and frame, of the ſame form with that for feeding the fire, muſt be fixt in the moſt convenient ſide of the furnace; the intention of which door is to ſerve for putting in and taking out the coffins; and it muſt therefore be placed ſo that one end of the frame may be cloſe to the chimney. The dimenſions of this door muſt be ten inches in height, and eight in breadth. Then the brick-work of the chimney may be proceeded with in the ſame manner as before; except that the back wall againſt the chimney muſt be raiſed no higher. But the ſpace it would take, if carried up higher, muſt be added to the cavity or hollow area of the furnace; the top of this wall ſerving as a ſupport to the coffins, which are to be placed upon it. Two pieces of fire-ſtone nevertheleſs, of ten inches length, and of the thickneſs of two inches ſquare, muſt be put with their lower part fixed at about three inches diſtance in the brick-work from the wall of the furnace, that the coffins reſting upon them, the flame and heat of the fire may paſs under as well as over them, and heat every part equally. Two vents into the chimney muſt be likewiſe made cloſe to each ſide wall of the furnace, and may be placed at the height of two inches above the level of the top of this wall, and of the dimenſions of four inches in breadth, and three in height. When theſe ſeveral parts have been completed, and the whole fabric is raiſed fifteen inches above the level of this wall, a dome of fire-ſtone muſt be fitted to it, in the ſame manner as was directed for the former furnace; only it is neceſſary, in this caſe, that though the inner or under ſide be concave, the upper ſhould be flat, for the coffins to ſtand upon it to heat before they be put into the furnace, to prevent their cracking from too ſudden an effect of the fire.

It is ſometimes practiſed to burn enamel on an hearth with charcoal, in order to which no apparatus is neceſſary but a proper hearth of fire-ſtone or bricks, and a ſkreen of brick, or ſome ſuch other material, through which to paſs the nozzle of the bellows to blow the fire without burning them.

The bellows for this purpoſe muſt be made in the manner of thoſe uſed for chymical experiments, to work with a weight, and to be moved by the operator as he ſtands by the fire; but a very ſmall pair of that kind will ſerve for this purpoſe.

Melting pots for fuſing the fluxes or colours are indiſpenſably neceſſary, the common crucibles being of too looſe a texture to contain vitreous bodies when perfectly liquefied. Theſe melting pots are not to be purchaſed, but muſt be made for the expreſs purpoſe. The proper materials are tobaccopipe-clay, or Sturbridge-clay (which is much cheaper here) two parts, and crucibles ground to powder, (or, in default of them, fine ſand) one part, which muſt be tempered with water, and well mixed together. The dimenſions muſt be regulated by the quantity of matter to be fuſed, and the ſhape may be a little conical, rather deep than ſhallow, to form which a ſolid mould of wood ſhould be procured for working them upon to bring them to a regular figure. When they are formed, they muſt be well dried, and then thoroughly baked before they be uſed.

Muffles, and where the quantity is great, coffins formed of the ſame matter, are requiſite for the burning, as well the grounds, as paintings in enamel. The uſe of muffles is to preſerve the enamel from being injured by the falling of the coals upon it, or by the ſmoke and fumes of the coal, which in many caſes is very detrimental to the colours. The matter of which the muffles may be fabricated may be the ſame with that juſt now given for the melting pots, and they muſt be alſo dried and well baked before they be uſed. The form of the muffles may be of two kinds; the one, that commonly uſed for eſſays; the other, a cloſe muffle fixt in the fire, which is a much more commodious method than the having them looſe.

The ſhape of the common muffle is only a flat ſquare piece bent into the form of an arch, of ſuch dimenſions, that, being laid over the enamel work to be burnt, it will cover it. Theſe may be beſt made by ſpreading the matter, properly tempered, on a piece of wood, turned to make a round correſpondent to the arch of the muffle, and working it even on the outſide by a knife, or other flat inſtrument, and it may be left on this mould, or round piece of wood, till it be moderately dry and firm. It is proper alſo to make a bottom to this kind of muffle, on which the plate may be laid; but this may be either a detached part, or joined to it. It is only a flat piece formed of the ſame ſubſtance, and of ſuch a magnitude as to ſuffer the muffle to reſt upon it every where; and, if looſe, to have a margin of half an inch for the better taking it out of the fire; but if fixt to the muffle, it need only be of the ſame extent with it.

The fixt muffle muſt be of the ſame general figure with the looſe kind; but the bottom muſt be always a proper part of it, and exactly of the ſize ſuitable to the extent of the arched part, without any margin.

The ſize of this kind of muffle muſt be adapted to the ſort of enamel work to be burnt in them; the breadth ſhould be ſuch as will ſuffer the pieces to be eaſily put in and taken out, and the height of the arch, where the form of the pieces does not require it to be higher, ſhould not be above two inches. The end of this arch within the fire muſt be cloſed up, ſo that when the muffle is paſſed through the iron frame in the ſide of the furnace made to ſupport it, and the joint made good by fire-lute, the hollow or cavity of it may be intirely cloſed, except the mouth or opening on the outſide of the furnace. The length of this kind of muffle ſhould be ſufficient to admit its paſſing five or ſix inches into the fire, and yet having a proper proportion remaining to project on the outſide ſomewhat beyond the iron frame. But theſe proportions are to be adjuſted by the room wanted. There muſt be a falſe bottom likewiſe made to this kind of muffle, which muſt fit the other bottom, ſo as to ſlide in and out of the muffle upon it; but it ſhould be made of ſuch length, that when it is thruſt home into the muffle, a part of it may project, that proper hold may be always taken for drawing it out. The deſign of this falſe bottom is, that the enamel work to be burnt, being laid upon it, may be put into the muffle and taken out without that difficulty and hazard of injury which would otherwiſe reſult from the form of the muffle.

Coffins for burning larger quantities of enamel work may be made of the ſame matter with the above. The figure of them may be that of ſquare boxes, of the length, when intended for a furnace of the dimenſions above given, of ten inches, of the breadth of ſix, and of the height of ſeven; which meaſures ſhould include alſo the thickneſs of the ſubſtance of which they are formed. In the cavity of theſe boxes, little columns, or projecting parts, ſhould be placed againſt the ſides riſing to half the height of the cavity, in order that a ſquare plate or piece of the form and ſize of the area may be laid on them hollow, as a flooring to ſupport a ſecond range or layer of the enamel work; and a lid muſt be likewiſe fitted to reſt in a proper groove made in the ſides of the boxes or coffins, at the top of them, that the fire and ſmoke may be wholly excluded from the cavity.

Crucibles of proper ſizes muſt likewiſe be had for calcining the metals; but as they are to be obtained every where eaſily, it is needleſs to ſay more of them.

Mortars for levigation muſt be likewiſe had of various ſizes; they ſhould be either of agate, flint, or glaſs; for thoſe of iron, or copper, would be liable to deprave greatly many of the colours, and to theſe ſhould be added a porphyry ſtone and mullar, marble being too ſoft to bear the attrition of many of the ſubſtances uſed in enamel, without imparting too much of its own ſubſtance in conſequence of ſuch abraſion.

Searces or ſieves of fine lawn muſt be alſo provided for ſifting ſome of the levigated ſubſtances, as alſo for ſpreading the powdered enamel to form the grounds; they ſhould be like thoſe of the apothecaries and druggiſts, with a cover and under part for preventing that waſte of the matter which attends the ſifting in the open air.

Tongs, with points bended at right angles, muſt alſo be procured for taking out of the fire the crucibles and melting pots. An iron inſtrument, like a baker's peel, is likewiſe neceſſary where the coffins are uſed; the flat part muſt be ſomething broader than the coffins, and of nearly the ſame length, and the handle ſhould be about three feet in length.

To theſe muſt be added bruſhes, pencils, tiles, and other common implements of painting; but as they are to be had every where, and their ſtructure is generally underſtood, it is not neceſſary to be more particular about them.

SECT. III.

Of the general nature and application of the ſubſtances uſed in enamel painting, with their previous preparation.

Of the ſubſtances uſed for forming fluxes.

MINIUM, or red lead, is uſed as a fluxing body for forming the enamel for grounds, as alſo in compounding fluxes for the colours. It requires no preparation for theſe purpoſes, only it is proper it ſhould be pure, which may be known by the method before given, p. 50. This flux renders the enamel ſoft, but, producing ſome proportion of yellow colour, is not fit for all uſes.

FIXT ALKALINE SALT of vegetables is ſometimes uſed alſo in forming the mixture for enamel grounds, as likewiſe in ſome compoſitions of fluxes for the colours. It makes a leſs ſoft enamel than the lead, but is free from yellow, or any other colour, and therefore proper for ſome purpoſes.

BORAX is a ſalt of very peculiar qualities, amongſt which is, that of promoting vitrification, and the fuſion of any glaſs when vitrified, in a greater degree than any other ſubſtance known; on which account it is of the greateſt conſequence in forming fluxes for enamel. It requires, nevertheleſs, either to be previouſly calcined or brought to a vitreous ſtate, which it ſuffers from the application of moderate heat alone; and it muſt alſo be finely powdered before it be mixed with other ingredients in fluxes. Its uſe is not much known in common practice, though of the greateſt conſequence to the art of enamelling; as not only a ſet of ſofter colours may be produced by the aid of it than can be otherwiſe had, but the degree of each may be brought to correſpond, by the employing it in different proportions, according to the reſpective hardneſs of the other ingredients, which differs ſo much as not to be regulated juſtly by any other means.

COMMON SALT may alſo be uſed as a flux in enamelling, particularly where there is occaſion for glazings; where, as it is extremely fluid, and free of tenacity when fuſed, as alſo leſs ſubject to crack than any other vitreous body, it is of great uſe; but for fluxes for grounds and colours in enamel, it is not frequently neceſſary to multiply ingredients, as the above three ſubſtances may, when properly

perly applied, ſufficiently anſwer moſt purpoſes. The ſame reaſoning extends to nitre and arſenic; which, though they have the qualities of fluxes, poſſeſs yet along with them ſuch others, with reſpect to their effect on ſeveral of the ſubſtances that compoſe the colours, as renders the methods of uſing them difficult and complex.

Of the ſubſtances uſed for forming the body of enamel, or fluxes.

WHITE SAND is uſed as a body for the fluxes and grounds of enamel; it ſhould be reduced previouſly to an impalpable powder, in order that it may be mixed more intimately with the other ingredients, which not only accelerates the vitrification, but renders the glaſs greatly more perfect. The kind of ſand, proper for this purpoſe, is that brought from Lynn in Norfolk, and called by the name of that place.

FLINTS are uſed for the ſame purpoſe as the white ſand, and it is proper to uſe them when that cannot be procured of the right kind. They require to be calcined before they are applied to any purpoſe of vitrification. This is to be done by putting them into any fire, and continuing them there till the whole ſubſtance becomes white, when they muſt be taken out, and, while of their full heat, immerſed in cold water, and kept there for ſome time. By ſuch treatment they will be rendered

dered of a very brittle and calcarious texture, and very eaſy to be powdered, which muſt be done to a perfect degree for the reaſon above given. Where ſmall quantities of the matter of any kind of enamel is to be prepared, calcined flints are preferable to ſand, as they are much more eaſily reduced to an impalpable powder, and the trouble of the previous calcination is very little.

There is a ſort of ſtone, which the French call *moilon*, that forms the upper cruſt, and lies round the free-ſtone in moſt quarries. This ſtone will loſe its tenacity in a moderate fire, and, when calcined, runs much ſooner into vitrification than either flints or ſand. It is therefore, when it can be obtained, a better matter for the body of fluxes or ſoft enamel than either of the other; as it will, with the ſame proportion of the fluxing ingredients, make a much ſofter flux: or it otherwiſe admits of the diminution of the proportion of ſome of them; which, for reaſons we ſhall ſee below, is in certain caſes an advantage.

Of the ſubſtances uſed for producing a white colour in enamel, or for forming the grounds.

PUTTY, OR CALCINED TIN, is uſed as a body of colour for the enamel grounds. As tin is very troubleſome in calcining, requiring a long continuance of fire, and to be ſpread into a very large ſurface, it is much the beſt way to procure it for the purpoſes of enamelling ready calcined, of thoſe who make it their proper buſineſs to calcine it for the uſe of lapidaries, and other artiſts who uſe it; for they have large furnaces, fitly conſtructed for performing that operation in large quantities, and can conſequently afford it much cheaper than it can be prepared in ſmall quantities, beſides the ſparing the trouble. It muſt be demanded of them by the name of *putty*, and care muſt be taken that it be not ſophiſticated, which it ſeldom fails to be before it comes out of their hands for common purpoſes. The ſophiſtication, which is generally by chalk, lime, or ſome ſuch white earth, may be thus diſtinguiſhed. Put the putty into a crucible with ſome tallow or other greaſe, and give it the heat of fuſion, or what is ſufficient to melt it, ſupplying the greaſe in freſh quantities as it burns away, till the calcined tin appear to have regained its metallic ſtate. Suffer then the remainder of the greaſe to burn away, and the chalk or earth, if any were mixt with it, will be found ſwimming on the ſurface of the metal, to which, however, the aſhes of the greaſe muſt be ſuppoſed to have added ſome little quantity. There is, nevertheleſs, another body with which the putty or calx of tin may be adulterated, that will not diſcover itſelf by this method of reduction of the tin. It is white lead, which, in this manner of treatment, would run into fuſion and mix with the tin, and could therefore not be diſtinguiſhed from it. But it may be eaſily rendered perceptible by another manner of proceeding, which is, to take the putty ſuſpected to be adulterated with it, and having put it into a crucible, without any admixture, and inverted another crucible over it as a cover, to give it a moderate heat, carefully avoiding that the ſmoke or coal of the fire may have any acceſs to it to change its colour. If there be any white lead mixed with the putty, it will ſhew itſelf when removed from the fire, and become cold in a yellow or brown colour. If no ſuch colour ſupervene, but the putty appear equally white as before it was heated, a concluſion may be ſafely made that it was not adulterated with white lead, or that, if ſophiſticated at all, it muſt be by ſome white earth, which may be made perceptible by the reduction of tin in the manner before-mentioned.

Where a very pure white is wanted for enamel, the eaſieſt and beſt method is to calcine the tin by means of nitre, which may be thus done.

" Take half a pound of ſaltpetre, and put
" it into a melting-pot, ſuch as is deſcribed
" p. 273, and put it into a fire to melt. When
" it is melted, throw in gradually ten ounces,
" or half a pound of tin filings, which ſhould
" be raſped as fine as poſſible; but give time
" for the exploſion that will follow, to
" ceaſe betwixt each quantity that is thrown
" in, ſtirring, however, the matter in the
" mean-time with the end of a tobacco-pipe.

"After the whole is put into a melting pot; "ſtir it again well about for ſome time, and "then take it out of the fire, pouring all the "matter out of the pot that can be got from "it by that means, and then ſoak the pot in "water till the remainder be ſoft enough to "be ſcraped from it; taking great care not "to let any part of the ſubſtance of the pot "be commixed with the calcined matter. "That which is moiſtened, in order to be "got out of the pot muſt be dried and put "to the other, and the whole well pounded, "and kept ſtopt up in a bottle for uſe. There "is no occaſion for edulcoration, or waſhing "the ſalts from the calx for this purpoſe, be"cauſe they are by no means detrimental, but "rather advantageous to the enamel."

ANTIMONY has been alſo applied to the ſame uſe as tin; but the expence and trouble of reducing it to a calx, which muſt be by deflagrating it with nitre, renders the uſe of tin much more expedient. Morret, in his notes of Neri, recommends equal parts of the antimony and nitre; but as that proportion does not calcine the antimony to whiteneſs, but produces the *crocus metallorum*, or liver of antimony, which is of a foul orange or reddiſh yellow colour, it is by no means ſufficient. He ſays likewiſe, that regulus of antimony will anſwer the ſame end; but in this he is ſtill further miſtaken; for the regulus, which is a metallic body, in ſome degree malleable, could never be reduced to powder, as he directs all the ingredients in the compoſition he preſcribes to be; nor if it were, would it form a white body on the fuſion with the other matter.

When antimony is uſed for the colouring white enamel, it ſhould be previouſly calcined by means of nitre, in the following manner.

"Take of antimony one part, ſaltpetre "three parts. Powder them well together, "and then throw it, by a ſpoonful at a time, "into a crucible heated red hot, waiting be-"twixt each time till the exploſion the mix-"ture will make, be entirely over. When "the whole matter is put into a crucible, and "has remained ſome time in a quiet ſtate, take "it out of the fire, and proceed in all reſpects "as was above directed for the tin, when cal-"cined in this manner."

The calx of antimony ſo produced will be of a finer white than the calx of tin can be eaſily brought to, unleſs by this method of calcination, and therefore more fit for purpoſes where great purity of colour is wanted, either in grounds or painting. But as the tin prepared in the ſame manner may be rendered very white, it will be leſs expenſive, as it requires leſs nitre to calcine it, and produces a much greater proportion of calx than the antimony.

ARSENIC is alſo uſed for forming a white colour in enamel; but it is a very nice matter to manage it well, as it is very ſoon changed by the heat into a tranſparent body, being itſelf a ſtrong flux, and it is therefore much better to omit the uſe of it, unleſs for ſome particular purpoſes, in the ſtate of white glaſs, as I ſhall below have occaſion to mention. Arſenic is alſo uſed as a flux; but its effects on ſome colours renders it not very ſafe without great knowledge of its qualities, and caution in its application.

Of the ſubſtances uſed for producing red, blue, yellow, &c. colours in enamel.

ULTRAMARINE (the preparation of which we have before given) is uſed in enamel where very bright blues of a lighter teint are wanted; and ſometimes, indeed, in other caſes, by thoſe who do not underſtand the right uſe of zaffer and ſmalt. But, there are few inſtances where zaffer, when perfectly good, fluxed with borax and a little calcined flint, or Venetian glaſs, to take off the fuſible quality of the borax, will not equally well anſwer with the beſt ultramarine. The ultramarine requires no preparation, when uſed in enamel painting, previouſly to its being mixt with the proper flux; and what relates to its general qualities, and the means of diſtinguiſhing its goodneſs or genuineneſs, we have, along with its preparation before taught, p. 71, and the following.

ULTRAMARINE ASHES are uſed where light ſemi-tranſparent blues are wanted. But they are ſo frequently adulterated with precipitations of copper, which, of courſe, turn green on fluxing, that it is very neceſſary to be cautious in the uſe of any parcel not previouſly tried.

ZAFFER is uſed for producing blue, green, purple, and black colours in enamel. It is an earth obtained by calcining a kind of ſtone, called *cobalt*; and when it is mixed with any kind of vitreous bodies, it vitrifies, and at the ſame time aſſumes a ſtrong blue colour, but, for the moſt part, verging to the purple. It is to be had, in a ſtate proper for uſe, of thoſe colourmen who make it their particular buſineſs to ſupply the glaſs-makers with colours. The goodneſs of zaffer can ſcarcely be known but by an actual trial of it, and comparing the effect of it with that of ſome other known to be good, and uſed in the ſame proportion.

MAGNESIA is an earth which, when fluxed with any vitreous body, produces a broken crimſon, or foul roſe colour. It is to be had, prepared fit for uſe, except a more perfect levigation, from thoſe who ſell colours to the glaſs-makers. It is uſeful not only for ſome purpoſes as a red, but for ſeveral compoſitions for black, purple, and ſome browns.

The goodneſs of magneſia muſt be determined by the ſame means as that of zaffer.

Smalt is, as before-mentioned, zaffer vitrified with proper additions which are generally fixt alkaline ſalts and ſand, or calcined flints, and is ſometimes uſed in a blue in enamel. But, being hard, it requires, for ſuch purpoſes, to be uſed with a flux; which increaſing the body of glaſs in too great a proportion for the tinge, is apt to dilute the colour too much, where great force is wanted; and therefore the uſe of the zaffer itſelf is in moſt caſes preferable. There have nevertheleſs been, as was above obſerved, ſome parcels of ſmalt, or vitrified calx of cobalt, brought from Saxony, which are of an extreme ſtrong body of colour, and will bear any proportion of flux neceſſary to render them as ſoft as may be required, without weakening the colour too much for any purpoſe. Common ſalt, however, ground very fine, and mixt with a fourth part of its weight of borax, (which is much the moſt powerful and kindly flux for zaffer) will run pretty well, and may be uſed where either a full colour is not demanded, or where the work will admit of the colours being laid on thick. The goodneſs of ſmalt may be judged of by its bright and deep colour, and the leſs it inclines to the purple, the better. In order to judge of the ſtrength of the colour, the ſmalt ſhould be reduced to a fine powder; for, in a groſſer ſtate, every degree of fineneſs renders it ſo different, that a judgment cannot be eaſily formed of it. Smalt is to be had of all colourmen, and is not ſubject to any adulterations, which would not be obvious on inſpection.

GOLD is uſed in enamel to produce a crimſon or ruby colour, which, by the miſtaken ſenſe of the Latin word *purpureus*, has been called *purple* by all the Engliſh and French writers. It muſt be previouſly reduced to the ſtate of a precipitated powder, by diſſolving in *aqua regia*, and making a precipitation by means of tin, fixt alkaline ſalt, or ſome other metallic or alkaline body. There have been ſeveral methods uſed for the making this precipitate of gold, but the following will anſwer the end certain, when the proceſs is duly conducted; but the ſucceſs depends on ſuch nice principles that it is very difficult to ſucceed to the utmoſt degree of perfection.

"Take of pure ſpirit of nitre eight ounces; "add to it of *ſal Ammoniacus*, ſcraped per"fectly clean, and powdered, two ounces; "which will convert the ſpirit of nitre to *aqua* "*regia*. Diſſolve, in four ounces of this *aqua* "*regia*, put into a proper phial, half an ounce "of purified gold, in the ſtate it is to be had "of the refiners, under the name of *grain gold*. "In order to haſten this ſolution, the phial "may be put into a gentle heat, where it muſt "continue till the gold intirely diſappear. "Take, in the mean-time, about the ſame "quantity of *aqua regia* in another phial, and "put into it filings or ſmall bits of pure block

" tin, ſo long as any briſk effervescence ariſe
" on the adding freſh quantities; but this muſt
" be done gradually, eſpecially if the filings
" be uſed; otherwiſe the mixture will heat ſo
" much as to boil over, or break the phial;
" drop then thirty or forty drops of the ſolu-
" tion of the gold into a half-pint glaſs of
" water, and immediately after about fifteen
" or twenty drops in the ſolution of tin.
" The gold will be then precipitated in a red
" powder from the ſolution in the *aqua regia*
" dropped into the water; and this operation
" muſt be repeated till the whole quantity of
" the ſolution be thus treated. When the
" laſt quantity of the red powder has been
" precipitated, pour off the clear fluid, and
" fill the glaſs with ſpring water; which,
" when the red powder has ſettled, muſt be
" poured off likewiſe. Hold then a ſponge
" wet, but well ſqueezed, to the ſurface of
" the fluid remaining with the powder; and
" when as much of the water as can be con-
" veniently ſeparated from it, by that means,
" is drawn off, lay the powder on a marble
" or porphyry ſtone to dry, taking great care
" that it contract no duſt or foulneſs."

This powder is the *gold purple*, *or precipitate of gold*; and is now fit to be commixt with the proper flux. If the proceſs ſucceed, it will, by this preparation, be of a fine crimſon colour, and perfectly anſwer the purpoſes of enamel painting.

Inſtead of uſing the ſolution of tin to precipitate the gold, the crude tin is moſt frequently employed; but the precariouſneſs of this method, which requires much more attention than that above given, over-balances the trouble of making the ſolution. For, if the ſolution be mixed with as much water in this method as in the other, it is very ſlowly acted upon by the tin; and if it be not diluted with ſo much water, it forms a gelatinous body, when ſtrongly ſaturated with the tin; which can never be ſeparated from the precipitated gold, but by means that are deſtructive to its qualities as an enamel colour. When the crude tin is uſed, however, the ſolution muſt be diluted with about treble its quantity of water; and the tin muſt not be longer continued in it than while the gold appears to continue to form a red powder on the ſurface of it, on its being freed from that which before adhered to it. It is better, nevertheleſs, on the whole, to uſe the two ſolutions, as it is more eaſy to preſerve a ſcarlet colour by that means; for, if the tin be too long continued in the mixture, it gives the colour a tendency to the purple. When a red colour is wanted, which verges greatly on the purple, a precipitation of the gold ſhould be made by means of any fixt alkaline ſalt. Which may be thus done.

“ Take the ſolution of gold in *aqua regia*
“ as before directed, and drop in it a ſolu-
“ tion of ſalt of tartar (which muſt be made

“ by melting half an ounce of ſalt of tartar in
“ a quarter of a pint of water) ſo long as there
“ appear an efferveſcence or ebullition on the
“ further addition. Let the precipitated pow-
“ der then ſettle, and proceed as was above
“ directed for the *calx caſſii*, or precipitation
“ with tin. The powder thus produced is
“ called *aurum fulminans*, from its quality of
“ exploding when expoſed to a moderate heat;
“ which muſt therefore be carefully guarded
“ againſt in the uſe of it, by keeping it out
“ of the reach of any ſuch heat till it be mixed
“ with the flux for enamelling; and it will be
“ the leſs hazardous, from being thoroughly
“ well freed from the ſalt, formed in its pro-
“ duction, by waſhing.”

The gold may be likewiſe precipitated in the ſame manner by volatile ſalts; in which caſe the volatile ſalt in the proportion of half the weight of the *aqua regia* may be diſſolved in four times its own weight of water. But this method does not produce ſo ſcarlet a red in the gold precipitation as that of uſing the ſolution of tin, as before directed.

This precipitation may be alſo made by mercury diſſolved in *aqua regia*; and it is ſaid that a finer colour is produced by this method than with tin; as likewiſe, that if the *aurum fulminans*, or any of the other precipitations, be fuſed with common ſulphur, they will be rendered of a much brighter red; but the ſulphur muſt in this caſe be ſuffered to burn away. Theſe methods, nevertheleſs, are attended with much more difficulty and hazard than the ſimple method firſt given; and, perhaps, unleſs by accident, not to be commanded, will not produce a better pigment for enamel painting.

Beſides the application of gold to form a red colour, it is uſed to produce the effect of gilding in enamel; for which purpoſe it muſt be reduced to the ſtate of a powder by precipitation, or mechanical preparation.

The gold precipitate which is found to anſwer this purpoſe beſt, in the caſe of gilding glaſs, is that prepared by means of volatile ſalt as above; but as this requires greater heat than can be admitted in the caſe of enamel, it is proper to employ thoſe which are made by metallic ſubſtances. The precipitate, which moſtly retains the luſtre of the gold, is that made by means of a ſolution of green vitriol or copperas in this manner.

"Take a ſolution of gold in *aqua regia*, "prepared as above directed; and add to "it gradually a ſolution of green vitriol or "copperas in water, till it appears that no "further precipitation of the gold be made, on "adding a freſh quantity. The ſolution of "the copperas may be made by putting one "dram of it powdered into an ounce of water, "and ſhaking them till the whole appear to "be diſſolved. After which the ſolution muſt "ſtand, and the clear part be poured off "from the ſediment, if any be found. The "fluid muſt be poured off from the preci-

" pitated gold, as ſoon as it is perfectly ſub-
" ſided; and the precipitation muſt be well
" waſhed, by pouring on it ſeveral ſucceſſive
" quantities of water. Roman or blue vitriol
" may be employed for this purpoſe inſtead of
" the green, but it is ſomewhat dearer, and
" has no advantage over the other. The gold
" precipitate thus obtained is very bright and
" ſhining. A ſimilar kind may be prepared
" by putting flat bars or plates of copper into
" the ſolution of the gold in *aqua regia*; but
" the precipitate is of a brown colour, with-
" out any luſtre or ſhining appearance."

SILVER is uſed for producing a yellow colour in enamel. It muſt be previouſly reduced to the ſtate of a powder, which may be done either by precipitation from ſpirit of nitre, or by calcination with ſulphur. The precipitation of ſilver from ſpirit of nitre, may be performed by diſſolving an ounce of ſilver in two or three ounces of ſpirit of nitre, and precipitating and edulcorating it exactly in the ſame manner as was above directed for precipitating the gold from *aqua regia*, by means of copper for gilding in enamel. A precipitation may otherwiſe be made by pouring brine on the ſolution of ſilver in the ſpirit of nitre, but I think the other method preferable. The calcination of ſilver with ſulphur may be thus performed.

" Put plates of ſilver into a crucible, with
" as much of the flowers of ſulphur betwixt

"them as will cover the ſurface of each plate, "and then place the crucible in a fire that "will heat it red hot. When it is thus heated, take it out of the fire, and the ſilver "will be friable or brittle, and muſt be reduced to a fine powder in a mortar of glaſs, "agate, or flint. The calcination may be "otherways made by mixing filings of ſilver "with flowers of ſulphur, in the proportion "of one ounce of the ſilver to half an ounce "of the ſulphur, and heating them red hot "in a crucible; or the ſulphur may be thrown "into the crucible after the ſilver is already "made red hot."

COPPER is uſed in enamel painting for the forming green, blue, and red colours; but it muſt be previouſly either calcined or reduced to the ſtate of a powder by precipitation. The calcination may be performed by means of ſulphur, in the ſame manner as is above directed for ſilver. It requires a ſtrong fire for two hours, when the copper will be found converted into a blackiſh red powder, which muſt be well levigated by grinding and ſifting. The copper ſo prepared, is called *ferretto of Spain*. It may be otherwiſe calcined, by ſtratifying it, in the ſame manner, with Roman vitriol; but a much longer continuance of fire is required in this method; and Neri ſays, it ought to be ſix times repeated to have the *ferretto* perfectly fine. When all this is done, nevertheleſs the ſubſtance produced cannot be really different, notwithſtanding the intimation of Neri to the contrary, from that of copper calcined with ſulphur, if the quantity of ſulphur employed be ſmall, and the time of the calcination well adjuſted. This muſt be judged of by the goodneſs of the *ferretto* when prepared; the criterion or mark of which is its appearing red when levigated. For, if it verge to the black, or purple, either the calcination has been too long continued, or the proportion of ſulphur employed was too great.

Inſtead of crude copper, the kind of latten, called by artificers in metals *aſſidue*, may be uſed; but as the plates of it are too thin to be treated in the way of ſtratification, or layers, as the quantity of ſulphur uſed would be much too great a proportion, it is better to clip the aſſidue with ſciſſars into ſmall ſhreds, and mix it by that means with the flowers of ſulphur; and the extreme thinneſs of the plates, in this caſe, renders the neceſſary time of calcination very ſhort.

Copper or braſs in thin plates, latten, or aſſidue, may be otherwiſe calcined without ſulphur, by expoſing them to a ſtrong heat for a conſiderable time. But as ſoon as the heat has rendered them friable, or brittle enough to bear levigation, it is the beſt way to powder the matter, and place it again in the fire thinly ſpread on a tile, or other ſuch convenient thing, ſtirring it ſometimes, that every part may be expoſed to the open heat. By this means, the calcination may be much accelerated. A due regard ſhould be had likewiſe in this caſe to the red colour of the calcined matter, as well as in the caſe of that calcined with ſulphur.

But, notwithſtanding, that it is requiſite for many purpoſes to have the copper calcined only to a ſtate of redneſs, yet it may be expedient, likewiſe, for ſome particular uſes, to prepare other quantities with a higher calcination. This muſt be continued till the copper appear of a dark purpliſh grey, or light black, when powdered, though it muſt yet retain ſome tinge of the red; for if the calcination be puſhed beyond that point, the *calx* becomes very difficult to be fluxed, and does not afford any colour in a kindly manner to the enamel.

The other method of reducing copper to an impalpable powder, is by *precipitation*; to which end the copper muſt be diſſolved in any acid, (for all will diſſolve it) and precipitated, by adding of a ſoluton of pearl-aſhes in water, in the ſame manner as was directed p. 92, for making the kind of verditer called *ſanders blue*, except in the uſe of ſtarch, which muſt be here omitted. For making green colours in enamel, this will be found preferable to the calcined copper.

To avoid the trouble of diſſolving the copper, as above adviſed, Roman vitriol, which is only a combination of copper with oil of vitriol, may be uſed in the place of ſuch ſolution. It muſt be previouſly diſſolved, by adding hot water to it in a powdered ſtate, and then the copper may be precipitated, by means of pearl-aſhes, in the ſame manner as from any other ſolution of it.

IRON is uſed to produce an orange red, or foul ſcarlet colour in enamel, as alſo a tranſparent yellow, and to aſſiſt likewiſe in the formation of greens and other compound colours. It is prepared many ways, both by corroſion and precipitation; ſome of which indeed make a real difference, but moſt of them lead to the ſame end. The only difference, in fact, is this: When the iron is highly calcined, and freed in a great degree, not only from all acid, but even its own ſulphur, the appearance of the crude calx will verge moſt upon a purple colour, and produce a foul purple enamel, if compounded only with a quantity of flux not ſufficient to vitrify it; but though, when compounded with a greater quantity of flux, it will vitrify into a tranſparent yellow, ſomewhat inclined to the red. But when it is leſs, or not at all calcined, and retains its own ſulphur, or perhaps ſome proportion of acid uſed in the preparation, it will in proportion be yellow, or verge towards the yellow, when uſed with the leſs proportion of flux, and produce a cooler or leſs red yellow, when uſed with a quantity ſufficient to vitrify it. Inſtead of uſing the crude iron in theſe preparations where it is to be precipitated or calcined, it is much better to uſe common green vitriol, which conſiſts only of iron and the acid of vitriol; from whence conſequently

quently the iron may be obtained in the ſtate to which theſe preparations lead by eaſier and leſs expenſive means than when uſed crude. But the preparation of the ruſt, formed by vinegar, requires the iron itſelf; and, if found neceſſary, is, nevertheleſs, the only inſtance where the precipitated baſis of vitriol will not anſwer the ſame end as the iron.

The firſt preparation of iron is, therefore, the ruſt by corroſion with vinegar, which may be thus made.

" Take of iron filings any quantity, the " finer they are the leſs trouble they will give " in the preparation, and ſprinkle them with " vinegar, rubbing them together after it is " added, that every part may be moiſtened " equally. Spread them in any cool place, " where they may be free from duſt, on a " board or paper, and let them remain there " till the moiſture appear to be dried away, " and then try if they be ſo corroded as to " bear powdering. If they be found to be " brought to a ſtate that will admit this, it " muſt be performed on a porphyry ſtone with " a mullar, or in a glaſs or agate mortar. But " if they appear not ſufficiently corroded, " they muſt again be moiſtened with vinegar, " and laid out as before, and, when become " fit, powdered in this manner. The pow- " dered ruſt muſt then be ſifted through a fine " ſearce, and the groſſer part, that will not " paſs, moiſtened again with the vinegar, " which muſt be repeated till none of the

" iron, worth further notice, remain uncor-
" roded. The whole muſt then again be le-
" vigated, till it be a perfectly impalpable pow-
" der, which will be then fit for uſe."

The iron, prepared thus by vinegar, is proper for making a tranſparent or glazing yellow in enamel, or for compounding with blues to form green colours. But this proceſs is greatly more troubleſome and laborious than thoſe below given, and is attended with no benefit in the produce, except that this ruſt will afford a cooler or leſs red yellow than the others, and may therefore be of advantage, in ſome particular caſes, for forming very bright greens.

It has been uſed to calcine the ruſt, prepared thus with vinegar, to form what is called the *crocus martis*; but it is a very injudicious method of proceeding; becauſe, where calcination is to be uſed, the vitriol, or the iron corroded by ſulphur, are equally good, and ſave a conſiderable trouble and delay.

Iron is ſometimes calcined *per ſe*, that is, without any mixture, by expoſing the filings, ſpread with a large ſurface, to the action of flame for a conſiderable time, which converts the iron into a *crocus martis*, that, when levigated, is fit for uſe. But this preparation is alſo troubleſome and inconvenient, requiring a ſtrong and continued fire; and, when made, affords nothing but what may be much eaſier obtained by the methods below given.

Iron is alſo calcined by means of ſulphur, which muſt be performed in the ſame manner as was directed above, p. 295, for the calcined copper. There is not, nevertheleſs, any difference betwixt this and the calcined vitriol.

The precipitation and calcination of green vitriol are the moſt expedient preparations of iron, and anſwer all the purpoſes of the others fully, except in the inſtance before-mentioned of not producing quite ſo cool a yellow as the ruſt formed by vinegar. The precipitation of vitriol may be formed in the following manner.

"Take any quantity of green vitriol and
" diſſolved it in water. Add to it gradually a
" ſolution of pearl-aſhes in water, (which need
" not in this caſe be purified if the ſalts be
" clean) till no more effervеſcence ariſe; and
" then pour off the fluid when the precipi-
" tated powder has ſettled. The remaining
" fluid, which cannot be poured off, may be
" ſeparated from the powder by means of a
" filter, and the powder then dried; for as
" the ſalts will be no way injurious to the
" enamel, there is no occaſion for waſhing in
" this caſe."

This ochre, or precipitated iron, will nearly anſwer the ſame end as the ruſt by vinegar, and will afford a tranſparent yellow almoſt as cool; this is therefore the beſt, and much the eaſieſt preparation of iron for forming greens, by the admixture of blue.

The calcined vitriol muſt be prepared from crude vitriol, where a red colour is wanted, in the ſame manner as was before directed, p. 51, for the ſcarlet ochre, which is itſelf indeed the ſubſtance in this caſe wanted, and will either afford, with leſs flux, a red colour in enamel, verging to the orange, or with more flux, a tranſparent yellow of the warmer caſt. But where calcined iron is wanted for forming more purple teints, the precipitated ochre, as produced by the above means, ſhould be taken and calcined with a ſtrong fire, till it acquire the degree of purple deſired, to which it may be brought by a much ſhorter calcination than any other preparation of iron.

ANTIMONY is uſed for producing a yellow colour in enamel, as well as the white before mentioned; and, indeed, it is the moſt uſeful, and moſt uſed, of any ſubſtance whatever for that purpoſe. It is prepared only by levigation, to which its texture, notwithſtanding its being a ſemi-metal, very well ſuits it. An orange colour, but not bright, may alſo be produced by antimony calcined with an equal weight or leſs of nitre, and then ſeparated from the ſcoria that will ſurround it, and levigated. But as there are methods of compounding an orange colour from preparations neceſſary for other purpoſes, there is no great occaſion to have recourſe to this. There is a great difference in the antimony itſelf in different parcels, ſome being greatly debaſed by mineral ſulphur, and others more free from it. That is beſt which is ſtriated, and has more the appearance of metal, or rather ſeems formed from needles laid parallel to each other; the blacker and more ſpongy being more impregnated with crude ſulphur. But antimony is ſo cheap, that it is of no conſequence, if the better part only of any parcel be uſed, and the reſt thrown away; and one ſide in almoſt every lump is good; as, in the fuſing to ſeparate it from the ore, the moſt metalline part of courſe ſubſides and ſinks to the bottom of the maſs.

GLASS OF ANTIMONY is alſo uſed ſometimes in enamel painting, being itſelf a fine tranſparent orange colour; but as it wants body, it has no great effect but in compoſitions. They who have occaſion for this glaſs may purchaſe it at ſo eaſy a rate as renders it ſcarcely worth while to prepare it themſelves, being manufactured at Venice, and elſewhere, in very large quantities, by thoſe who make it their buſineſs. The only care ſhould be, to chooſe ſuch as is not adulterated by the admixture of glaſs of other kinds, which may be diſtinguiſhed by the force and deepneſs of the colour, or the want of them.

MERCURY is ſometimes alſo uſed in enamel painting; but it requires to be prepared by ſome chymical proceſs before it can be uſed. There are two preparations already practiſed for medicinal purpoſes, which fit it alſo for enamel painting the beſt of any. The produce of one is called turpeth mineral; for which we have already given the proceſs, p. 108, by a careful treatment of which, a fine cool yellow may be produced in enamel. The other affords the red precipitate, which is a fine ſcarlet red, but extremely tender with reſpect to the fire. As this ſubſtance can be procured at a very moderate rate of thoſe who vend it as a medicine, and requires a particular nicety in the operation, I ſhall wave giving any proceſs for it here, eſpecially as every book which treats of the chymical pharmacy contains one; and, indeed, the uſe of both this and the turpeth mineral demand ſo delicate a management of the fire, and are ſo liable to have their effect deſtroyed by a ſecond burning, (if, as is ſo frequently the caſe, it ſhould be neceſſary) that I cannot greatly recommend them in preference to other preparations, which will anſwer the ſame ends nearly as well with eaſe and ſafety.

ORPIMENT has been alſo uſed in enamel for producing a yellow colour; but it is very tender with regard to the fire, and requires ſo ſoft a flux, while at the ſame time antimony, properly managed, will ſo well ſupply the place of it, that it is rarely uſed.

Powdered bricks have been alſo uſed for compounding yellow colours in enamel; but as they act only in conſequence of the ochre they contain, they are certainly inferior to the prepared ochres we have given, eſpecially as they are liable to great impurities, and are harder, or require a greater force of flux than the pure ochres or calcined iron. When they are uſed, they ſhould be choſen of the reddeſt colour, the ſofteſt and eveneſt texture, and intirely free from all ſtones or cinders. The Windſor bricks, therefore, are much the beſt that are to be procured here, as they anſwer to the circumſtances required much better than any other.

TARTAR is alſo uſed in forming enamel colours, though not from any tinging quality it has in itſelf, but for its effects in modifying magneſia, and ſome other ſubſtances. The crude red tartar ſhould be choſen for this purpoſe, and requires no other preparation but to be freed from all impurities, and well levigated.

Theſe are the ſeveral ſubſtances that are materially neceſſary for compoſing as well the grounds as colours and fluxes in enamel. There have been many others introduced into the practice of particular perſons, and ſome indeed into more general uſe; and the preparations of thoſe have been likewiſe greatly varied and multiplied. But what I have given are more than ſufficient for every purpoſe; as all the variety of teints, with all the degrees of the attendant qualities, may be produced by a proper application to them; and the increaſing unneceſſarily the number of ſimples and original preparations can only lead to confuſion and embarraſſment. Whoever, moreover, acquires a moderate knowledge of the principles and ſubjects here laid before them, may eaſily proceed to examine or uſe any other colouring ſubſtance which is fitted by its texture to endure the heat of vitrification.

SECT. IV.

Of the compounding and preparing the fluxes for enamel painting.

IN order to the underſtanding, and conſequently managing more advantageouſly the ſeveral compoſitions for fluxes, it will not be improper to inquire a little more particularly into the nature of the ingredients, and their operation on each other, as well as the proportion of power each has in producing its proper effect; ſince, by this means, the ſeveral mixtures may be better adapted to the purpoſe, on each occaſion, by thoſe who uſe them, when their nature and degree of efficacy is well underſtood, than they poſſibly can by any particular recipes, though in order to give ſuch an initiative knowledge of each particular as may lead to proper experiments, I ſhall ſubjoin a complete ſet of ſuch recipes, as well for the preparation of theſe as the colours.

There are two kinds of ſubſtances enter the compoſition of enamel fluxes. The one the proper matter of the flux, being ſuch bodies indued with a great propenſity to run into the vitreous fuſion, or be converted into glaſs, and which act, in this view, not merely in a paſſive capacity, by becoming glaſs themſelves, but, when become ſo, changes and aſſimilates other bodies to their own vitreous nature. This kind conſiſts of ſalts, lead, and arſenic. The other kind conſiſts of the correctives of theſe proper fluxings, which, without the admixture of ſuch correctives, would be found to have qualities that would deprave them for the ſeveral purpoſes of enamel painting. For ſalt, when vitrified alone, or with a ſmall proportion of other bodies, are ſtill liable to be diſſolved by aqueous moiſture; and glaſs, under ſuch circumſtances, is extremely apt to ſuffer a corroſion by the air, and turn black and dull on its ſurface; whence it is neceſſary to combine ſome other bodies with the ſalts, which may counteract theſe bad tendencies, and render the compoſition durable. Lead and arſenic, likewiſe, when formed into glaſs, of which they compoſe the principal part, are liable to corroſion by the air, and to acquire ſpecks and a dull ſurface, which makes it neceſſary to add ſuch ſubſtances to them as will prevent this effect. Theſe corrective bodies of the proper matter of the flux, which therefore make the other kind of ſubſtances of which enamel fluxes are compoſed, are calcined flints, ſand, or ſuch calcarious matter; which being perfectly white, and reſiſting, in a vitreous ſtate, the corroding or diſſolving action of all menſtrua, give body and firmneſs to the fluxing compoſitions without diſcolouring, or any other way changing the proper fluxing qualities, except by diminiſhing, in a certain degree, their vitrifactive power, and conſequently rendering them ſomewhat weaker as fluxes than they would be alone.

The moſt active flux amongſt ſalts is *borax*, which, indeed, poſſeſſes this power in the greateſt degree hitherto known of any ſimple whatever. The next is *lead*, which vitrifies with a very moderate degree of heat, and aſſimilates to glaſs, with itſelf, not only many kinds of earth, but all metals and ſemi-metals, except gold and ſilver in their intire ſtate. *Arſenic* is the next powerful flux, only it requires to be fixed by conjoining it with ſome other body already vitrified, otherwiſe it ſublimes and flies away before it arrives at the vitrifactive heat. The ſeveral kinds of ſalts have the next degree of fluxing power, and among them ſea ſalt poſſeſſes the greateſt. But they are not ſufficiently ſtrong themſelves, to form an enamel flux ſoft enough to be uſed in painting; though, as they are colourleſs, which is not the caſe of vitrified lead, they are very neceſſary to be compounded with lead, or uſed in its place, aſſiſted by borax, where abſence of every degree of colour is neceſſary in the flux.

Of the general method of preparing fluxes.

The method of preparing the ſeveral fluxes below given is the ſame for all. The ingredients are to be well levigated with each other on a porphyry ſtone, with a mullar of the ſame matter, or of flint; or in a mortar of agate, or flint with an agate peſtle, except where great quantities are to be prepared, in which caſe a mortar and peſtle of the common green glaſs may be previouſly uſed for the ſake of expedition.

Being levigated, the matter ſhould be put into pots of a proper ſize, made of the ſubſtances, and in the manner directed p. 273, and placed in a furnace where the heat is nearly that of a ſtrong culinary fire. For though a greater heat accelerates the vitrification, yet it renders the compoſition harder, that is, weakens its fluxing power. When the vitrification is perfect, which muſt be known by the matter's becoming tranſparent, and free from air bubbles, it muſt be taken from the fire, and poured out on an iron plate clear of any ruſt.

Then being powdered when cold, if the operation appear to have ſucceeded, the produce muſt be kept for uſe; but, if any turbidneſs or foulneſs appear in particular parts, ſuch parts ſhould be picked out; or, if the whole be depraved with ſpecks, or be cloudy, it ſhould be again powdered and fuſed, and then treated in the ſame manner as at firſt.

Of glaſs of lead.

Simple glaſs of lead, though a ſoft flux, is not proper to be uſed alone; for the air, as was before mentioned, corroding it, a cloudineſs or ſkim is apt to come on the ſurface, which gives a dulneſs and unpleaſing appearance to the enamel, and ſometimes fouls the brighter colours. As this glaſs forms, however, in a more compound ſtate, one of the beſt fluxes, the preparation of it ſimply is neceſſary to be known; for though the ingredients which compoſe it might be fluxed together with the other ingredients of the fluxes and colours, yet it is better to vitrify it ſeparately firſt, and conſequently purify it from thoſe feculences and droſs which are apt to be formed in the firſt fuſion. The manner of preparing glaſs of lead, ſuch as is to be underſtood to be meant in the ſucceeding recipes, is as follows:

"Take of red lead two pounds, of flints calcined and levigated as above directed, p. 280, or, in default of flints, of white ſand ground to fine powder, one pound; vitrify and prepare them according to the general directions before given."

Compoſition of a flux, for common purpoſes, moderately ſoft.

N° 1.

"Take of the glaſs of lead one pound, of pearl-aſhes ſix ounces, of ſea ſalt two ounces.

" Treat them according to the general directions for fluxes."

This is a very cheap flux, and will ſerve extremely well for all purpoſes where a tinge of yellow will not be injurious, or where the flux is not required to be extremely ſoft.

Compoſition of a ſoft flux for common purpoſes.

N° 2.

" Take of the glaſs of lead one pound, of " pearl-aſhes ſix ounces, of borax four ounces, " of arſenic one ounce. Proceed according " to the general directions."

This is a very ſoft flux, and will vitrify a very large proportion of zaffer, or the precipitated powders, or calxes of metals. It is therefore very proper for forming ſtrong glazing colours, where harder fluxes are uſed with the reſt, or for all purpoſes where there is any neceſſity for, or convenience in, burning the enamel with a ſlighter heat.

Compoſition of a tranſparent flux, perfectly white, and moderately ſoft.

N° 3.

" Take of common flint glaſs powdered " one pound, of pearl-aſhes ſix ounces, of ſea " ſalt two ounces, of borax one ounce. Pro- " ceed as with the others."

This is proper for purples, crimſons, and ſuch colours as are injured by any tinge of yellow; as alſo for white, where purity is required. It is rather harder than N° 1, above given, but that may be corrected, where neceſſary, by any intermediate proportion of borax between that given here and in the next.

Compoſition of a tranſparent flux perfectly white, and very ſoft.

N° 4.

" Take of common flint glaſs powdered one
" pound, of pearl-aſhes and borax each four
" ounces, of common ſalt and arſenic each
" two ounces. Mix and flux them according
" to the general directions. But they
" muſt remain in fuſion longer, if any cloudi-
" neſs appear in conſequence of the arſenic;
" which, though indued with a ſtrong fluxing
" power, when in a vitreous ſtate, does not
" nevertheleſs vitrify, when the proportion is
" large with reſpect to the other ingredients,
" ſo quickly as they do, but gives a milky
" turbidneſs to the glaſs till its own vitrifi-
" cation be perfect."

This is a very ſoft flux, and proper in all caſes, where ſuch is neceſſary, and the yellow tinge of the common ſoft flux above given would be detrimental. But the proportion of borax or arſenic may be varied as is above intimated, either in this, or any of the other compoſitions; or the arſenic and ſea ſalt omitted according to the occaſion. The proportions

tions of the other ingredients ſhould however be adhered to, becauſe they are ſuch as are moſt advantageous with reſpect to the relation the qualities of each have to the other, and to the general intention.

Of the white Venetian glaſs as a flux.

The principles on which fluxes are formed, and the nature of the ſubſtances proper to form them, having been very little underſtood, or indeed known, and the compoſitions of the fluxes uſed having been kept ſecret at Venice and Dreſden, or by the few elſewhere who have learnt them, it has been almoſt univerſally practiſed to uſe the white Venetian glaſs as a flux. It has not, nevertheleſs, that I know of, been lately imported into this country, or any where regularly ſold for this purpoſe, but obtained by thoſe who uſe it, by ſeeking out drinking-glaſſes, ſmall vaſes, or other ſuch wrought pieces. Indeed I am in ſome doubt whether the ſame glaſs be now made at Venice, or elſewhere, but that what is found is the remains of a kind formerly made, and diſperſed all over Europe, while the Venetians had the monopoly of ſuch ſort of manufactures wholly in their hands. This glaſs is of a moderate ſoftneſs, and agrees very well with the colours in general; but having a milky turbidneſs, muſt certainly be leſs advantageous to the tranſparent or glazing colours than a flux perfectly

fectly pellucid. The compoſition of this glaſs is not known at preſent to any here, for all the kinds deſcribed by Neri ſeem much harder than this; though, as he gave all the compoſitions then in uſe in Italy, and particularly underſtood the Venetian manufacture, one might have expected he would have taken it in, as it muſt have been made in very large quantities, from the copious remains of it we find in every part of Europe. This glaſs may be known from any common kind by its having a milky turbidneſs, by which it may be diſtinguiſhed from all tranſparent ſorts, and by its yet coming much nearer to tranſparency than any of the white opake kinds made at preſent.

SECT. V.

Of the compoſition and preparation of white enamel for grounds and other purpoſes.

Compoſition of common white enamel of moderate hardneſs.

N° I.

“TAKE of glaſs of lead one pound, of
“ pearl-aſhes and calx of tin each half a
“ pound. The ingredients being thoroughly
“ mixt,

" mixt, by grinding them together on a porphyry ſtone, or by pounding and rubbing them well in a glaſs mortar, put them into a proper melting pot, and give them a moderate heat till they incorporate thoroughly: but the fuſion ſhould not be either ſtrong or long continued; for, if the glaſs be perfectly liquefied, the calx of tin is apt to ſubſide; and, conſequently, to be unequally mixt in the maſs when cold. When the heat has had its due effect, take the pot out of the fire, and pour the matter on a clean iron plate, or into molds to form it into cakes, like the Venetian enamel, if it be ſo deſired."

This is ſofter than the common white glaſs, and about the degree of the common Venetian enamel. It is not very white, nor conſequently fit for dial-plates, or other purpoſes where the clearneſs of colour is required; but for paintings where it will be covered, or where pure white is not neceſſary, it will extremely well anſwer all purpoſes.

Compoſition of a very ſoft white enamel for common purpoſes.

N° 2.

" Take of glaſs of lead one pound, of pearl-aſhes and calx of tin each half a pound, of borax and common ſalt each two ounces, and of arſenic one ounce. Treat them as

" the foregoing; but be very ſparing of the " heat, and take the matter out of the fire as " ſoon as it forms one homogeneous maſs, " without ſuffering it to fuſe till it be perfectly " fluid."

This is very ſoft, and will ſcarcely admit, if uſed as a ground, the fluxing of colours upon it, without running into fuſion itſelf with the ſame heat; and, conſequently, mixing with and depraving them; but where it is uſed without any view to painting over it, either in its own proper colour, or mixed with any other, particularly with black, it is preferable to hard enamel, becauſe it can be wrought with a much leſs heat, and, conſequently, is both more eaſy to be managed, and leſs liable to give occaſion to the warping or calcining the metal plates, or other bodies, on which it is laid.

Compoſition of enamel of moderate hardneſs, but more perfectly white.

No 3.

" Take of flint-glaſs one pound, of calx of " tin or putty, of the firſt degree of whiteneſs, " half a pound, of pearl-aſhes and common " ſalt each four ounces, and of borax one " ounce. Treat them as the foregoing; but " the fire may be more freely uſed than in " the caſe of the laſt."

This enamel, if the calx of tin or putty be perfectly good, will be very white, and is proper for dial-plates, or other ſuch uſes, where the purity of the white ground is eſſential to the value of the work. It will alſo bear colours very well, where ſuch a ground is wanted for any painting; but if it be found too ſoft, in proportion to the fluxes of the colours, it may be prepared of a greater degree of hardneſs by omitting the borax.

Compoſition of a ſoft enamel more perfectly white.

No 4.

" Take of flint glaſs one pound, of pearl-
" aſhes and common ſalt each four ounces, of
" borax two ounces, and of arſenic one ounce.
" Treat them according to the general direc-
" tion; but be ſparing of the fire as with N° 2."

This is too ſoft for a ground for colours, but is fit for any other purpoſes where enamel of greater whiteneſs is required, as alſo for uſing with other colours where there is occaſion to paint with white.

Compoſition of a very ſoft enamel, of the firſt degree of whiteneſs, proper for painting.

N° 5.

" Take of flint glaſs one pound, of anti-
" mony, calcined to perfect whiteneſs, accord-
" ing to the directions in p. 258, or of tin,
" calcined with nitre, according to the direc-
" tions in p. 283, half a pound, of pearl-aſhes

"and common ſalt each three ounces, of borax three ounces, and of arſenic one ounce. "Proceed according to the general directions; but be very careful to avoid ſuch a "fuſion as will render the matter perfectly "liquid."

This compoſition produces an enamel extremely white and very ſoft, and is proper to uſe in painting for linen, or other objects where ſtrong touches of white are advantageous. If it be found too ſoft, according to the tone of the fluxes for the other colours, the arſenic may be omitted, and part of the borax; but it will, in this proportion, ſuit the other colours, when the fluxes are judiciouſly adapted to each kind.

Of common white glaſs as an enamel ground.

The white glaſs made at Mr. Bowle's glaſshouſe in Southwark, is frequently uſed for the grounds of enamel dial-plates, and other painted works. It is a glaſs rendered of an opake whiteneſs by the admixture of a large proportion of arſenic, which, intimately mixed with the glaſs by a ſlight fuſion, not ſufficient to produce a vitrific incorporation, retains its opacity, and conſequently gives a whiteneſs to the glaſs; though, if the fuſion were long enough continued, it would aſſimilate with the glaſs, and the whole maſs conſequently become perfectly tranſparent. This tendency to loſe its opacity, of courſe renders the uſe of it as a ground enamel more limited and difficult; becauſe where colours are to be uſed which require repeated burning, or to be continued a longer time in the fire, there will be a great hazard of changing the opake whiteneſs into tranſparency, or ſuch an approach to it as deſtroys the effect of the ground; and, indeed, in the burning it, even as a ground, particular care is required in the manner. It is likewiſe harder than the Venetian common glaſs, or any of the above preparations of ground enamel, as likewiſe much more brittle, and liable to crack and peel off from the body painted with it; but, notwithſtanding theſe diſadvantages, its low price, and great whiteneſs, which much ſurpaſſes that of the Venetian, or any enamel commonly to be had, have recommended it to the practice of many who are concerned in cheaper works of enamel.

SECT. VI.

Of the compoſition of the colouring ſubſtances, together with the proper fluxes, in order to the painting with all the variety of colours in enamel.

Compoſition for the ſcarlet or crimſon red, improperly called purple of gold.

N° 1.

" TAKE of the fluxes, N° 1, or 2, or " Venetian glaſs, ſix parts, and of the " *calx caſſii*, or precipitate of gold by tin, as " directed p. 289, one part; mix them well " together and paint with them."

This will produce a very fine crimſon colour, according to the teint of the precipitate of gold uſed; for it may be prepared very crimſon by the means above directed, as I have more than once ſeen, though, as it is commonly prepared, it verges to the roſe or purple. If the effect of red be not ſtrong enough, but the colour tend too much to tranſparency, it may have a greater body given it by adding more of the precipitated gold.

Compoſition for tranſparent ſcarlet, or crimſon colour.

N° 2.

" Take the flux, N° 2, ſix parts, the preci-
" pitate of gold with tin one part. Flux them
" together, with a ſtrong fire, till the whole
" appear a tranſparent deep red glaſs. Then
" pour out the matter on a clean iron plate,
" and levigate it well, when it will be fit for
" painting."

This preparation will anſwer the end of lake in oil painting, either for glazing or making dark ſhades of red. A greater quantity of the gold precipitate may be added where a ſtronger force of colour is deſired to be had, and the compoſition muſt in that caſe be longer continued in fuſion. But the flux will not always vitrify more than this proportion, ſo as to render it perfectly tranſparent.

If this preparation be mixed, after it has been levigated, with a ſixth part more of the gold precipitate, and uſed without a ſecond fluxing, it will give a very fine deep crimſon, extremely ſerviceable in many caſes.

Compoſition for a bright orange red.

N° 3.

" Take of the fluxes, N° 2 or 4, two parts,
" of red precipitate of mercury one part. Mix
" them for painting."

This

This makes a very bright orange red, but is very delicate, requiring only juſt ſo much heat as will run the parts of the flux together. It is therefore difficult in its uſe where harder compoſitions are to be burnt with it.

Compoſition for a cheaper, but fouler ſcarlet red.

No 3.

" Take of the flux, No 1, two parts, and of " the ſcarlet ochre as prepared in p. 51, one " part. Mix them well together, and avoid " too much or too long heat."

This is the common red in China, and other enamel paintings. It may be enlivened by mixing one part of glaſs of antimony with one part of the flux, inſtead of uſing the flux alone.

Compoſition of a cheap crimſon.

No 4.

" Take of the flux, No 1, four parts, of " magneſia one fourth of a part, and fuſe " them till the whole maſs be tranſparent. " Mix them then with one part of copper " calcined to redneſs, and paint with the " compoſition. Where this is required to be " tranſparent, the calcined copper ſhould be " vitrified with the other ingredients; but " this requires great care to take the compo- " ſition out of the fire as ſoon as the vitrification is perfected."

A little white enamel, or, what is better, a little of the tin calcined, by means of nitre, as in p. 283, may be added, to give the colour a body. But this neceſſarily dilutes the colour, and weakens the force of it.

This red is very tender, and requires only ſo much heat as will incorporate the ſubſtances together. But if it be found too ſoft for the tone of the fluxes of the colours, inſtead of uſing the flux, flint glaſs with a ſmall part of flux may be employed for mixing with the magneſia.

The management of this colour, is, however, ſo difficult and nice, where it is uſed in very light touches, that in nicer paintings it is better to uſe the precipitate of gold properly broken by the admixture of other colours, where a fouler crimſon is wanted, then to be troubled with watching this. But in groſſer works, where the colours are uſed in great quantities, and laid on with a ſtronger body, this becomes very ſerviceable.

In the recipes given for the red formed by calcined copper, it has been uſed to order an equal, or ſome ſuch proportion of red tartar. But where the glaſs contains any lead, I am apt to believe a reduction of it would follow, which would decompound the body of the flux, and render the compoſition harder. If tartar be uſed, the flux ought to be formed therefore of glaſs of ſalts.

Compoſition for pink and roſe reds.

N° 5.

" Take any of the above compoſitions,
" and add of any of the white enamels, or
" of the calx of tin prepared with nitre, or
" calx of antimony, as much as ſhall be ſuf-
" ficient to dilute the colour to the degree re-
" quired."

Compoſition for the brighteſt blue.

N° 6.

" Take of the fluxes, N° 1 or 2, or of
" the Venetian glaſs ſix parts, of the fineſt
" ultramarine one part. Mix them well for
" painting. If a tranſparent blue be deſired
" from ultramarine, a ſixth or eighth part
" muſt be added to the flux N° 2, and the
" mixture kept in fuſion till the ultramarine
" be perfectly vitrified, and the whole become
" tranſparent."

If the body of colour be not ſufficient, more ultramarine may be added; but, in order to ſpare it, a ſmall proportion of zaffer, fluxed with four or ſix times its weight of borax, may be added; which, if the zaffer be perfectly good, will make the ultramarine appear much darker, without imparing its brightneſs.

Compoſition of a lighter blue.

N° 7.

"Take of the fluxes, N° 3 or 4, five parts, "of ultramarine aſhes one part. Mix them "for painting."

This is uſed by thoſe who do not know the proper manner of uſing zaffer; but as the pure ultramarine aſhes have a ſtrong tinge of the red, and are never of the firſt degree of brightneſs, the ſame effect, or indeed a ſuperior one, may be produced by the compoſitions below given.

If the ultramarine aſhes are adulterated with copper, as is moſt frequently the caſe, a green and not a blue will be produced.

Cheaper light tranſparent blue.

N° 8.

"Take of the deepeſt coloured common "ſmalt, and uſe it ſimply; or, if it be too "hard for the other colours, as frequently is "the caſe, add to it a ſmall proportion of cal- "cined borax."

If the ſmalt be good, the colour will not want brightneſs; but it will always be warm, and tending to the purple. Its cheapneſs is however a great recommendation in many caſes.

Compoſition of a deep tranſparent blue.

N° 9.

" Take of any of the fluxes four parts, of
" zaffer one part. Mix and fuſe them with
" a ſtrong fire till the whole maſs be per-
" fectly tranſparent; but, if the quantity of
" flux be not ſufficient to vitrify the zaffer,
" add more, or a ſmall proportion of borax.
" When the vitrification of the whole is per-
" fect, pour out the compoſition, and levigate
" it for uſe."

This will produce a very fine tranſparent blue; and, being extremely deep, will make very ſtrong ſhades, and give the effect of blackneſs, where there is a ſtrong body of it laid on.

This may be done with leſs zaffer, when a leſs ſtrong effect of the colour is wanted.

Compoſition of a very dark tranſparent blue.

N° 10.

" Take of the fine Saxon ſmalt, mentioned
" p. 288, and mix with it one fourth of its
" weight of calcined borax, or one-third of
" its weight of purified pearl-aſhes,"

This will run eaſily, and will produce a very fine dark blue of the deepeſt hue. But where this kind of ſmalt cannot be obtained, compoſition, N° 9, muſt ſupply its place; and if the zaffer be good, will not be a bad ſubſtitute; but it cannot be expected to have the full brightneſs of ultramarine.

Compoſition of a ſky blue.

No 11.

"Take of any of the above preparations,
"and add of any of the white enamels, or
"calxes of tin or antimony, as much as will
"be ſufficient to produce a blue of that light-
"neſs which may be wanted."

By forming a blue in this manner, from the compoſition No 6, the effect of the ultramarine aſhes may be fully produced as is above intimated, without the defects that are generally found in them.

Compoſition of azure blue from copper.

No 12.

"Take of the fluxes, No 3 or 4, five parts,
"of copper calcined to a purple colour and
"of zaffer each one part. Mix and flux
"them well together, and then levigate with
"the mixture, of the calx of antimony or tin,
"calcined by nitre, one part, and keep the
"matter for painting."

This is ſo precarious with reſpect to the ſucceſs, that it is rarely uſed; but it will ſometimes produce a good blue, and is then cooler and better for ſome purpoſes than the blues formed either of zaffer and white, or the ultramarine aſhes.

Compoſition of a bright opake full yellow.

No 13.

"Take of the fluxes No 1 or 2, four parts, "and ſilver calcined with ſulphur, as in p. 294, "and of antimony each one part. Mix and "flux them well together till the whole be "perfectly vitrified. Then levigate with them "one part of antimony or tin, calcined by "means of nitre, and keep the matter for "painting."

This is a full true yellow, and the brighteſt coloured compoſition that can be uſed. It may be made deeper by diminiſhing the proportion of the calx of antimony or tin.

Compoſition of a bright tranſparent yellow.

No 14.

"Take of the fluxes No 1 or 2, ſix parts, "of calcined ſilver two parts, and of antimony one half part. Flux them well till "the whole be tranſparent; and then levigate the colour for uſe. Where great tranſparency is wanted, the antimony may be "omitted."

This is a very deep bright yellow; and proper for ſhades or glazing, where great force and purity of colour is required; but for moſt purpoſes the cheaper tranſparent yellow will anſwer the ſame end, not being greatly faulty in point of brightneſs.

Compoſition of a bright tranſparent yellow from ſilver and iron.

N° 15.

“ Proceed as in the above, only inſtead of “ the antimony take the precipitated iron as “ obtained from vitriol, according to the di- “ rections in p. 301.”

This will be more tranſparent in general than the ſame preparation with antimony; which, differing in the proportion of crude ſulphur it contains, does not always ſubmit to be vitrified to a greater degree of tranſparency. The yellow prepared in this manner will likewiſe be very cool and true, and conſequently proper for forming ſome kinds of greens.

Compoſition of a cheaper opake full yellow.

N° 16.

“ Take of the fluxes, N° 1 or 2, or Vene- “ tian glaſs, ſix parts, of antimony one part, “ and of the iron precipitated from vitriol half “ a part. Mix and flux them well together “ till the matter be thoroughly vitrified, and “ then levigate them with one part of tin cal- “ cined to whiteneſs.”

This will differ only from the yellow of N° 13, in not being quite ſo bright and full, but will, nevertheleſs, be a very ſtrong pure yellow, and fit for all uſes where the greateſt brightneſs is not requiſite.

Compoſition of a warmer opake yellow.

N° 17.

" Proceed as in the above, only inſtead of " the precipitated iron take the ſcarlet ochre " prepared as in p. 51."

Compoſition of a cheaper tranſparent warm deep yellow, to anſwer the purpoſes of brown pink.

N° 18.

" Take of the fluxes, N° 1 or 2, ſix parts, " and of the precipitated iron one part; mix " and fuſe them in a ſtrong fire till the maſs " be tranſparent."

This will verge towards the orange, but will not be ſufficiently bright to anſwer the purpoſe of a pure yellow. It is, however, extremely valuable for ſhading yellow, and other uſes where a brown is required.

Compoſition of a warmer tranſparent yellow, for the ſame purpoſes as the preceding.

N° 19.

" Take of the fluxes, N° 1 or 2, ſix parts, " of ſcarlet ochre one part, and of glaſs of " antimony half a part; mix and fuſe them " till the maſs be tranſparent."

This differs from the laſt only in verging ſomewhat more to the red.

Compoſition of a tranſparent yellow from orpiment.

No 20.

“ Take of the flux, No 2, three parts, and “ of the refined orpiment, or King's yellow, “ one part; mix them by levigation for uſe.”

This compoſition is extremely tender, and muſt have no more fire than will juſt make the parts of the flux cohere.

If this yellow be deſired warmer, a little glaſs of antimony may be added, or a proportion of red orpiment may be uſed with the yellow.

Compoſition of lighter yellows.

No 21.

“ Add to any of the above common calx of “ tin or putty; or, if great brightneſs be ne- “ ceſſary, the calx of tin or antimony calcined “ by means of nitre.”

Compoſition of a very bright opake green.

No 22.

“ Take of ultramarine and yellow, No 13, “ each one part, of the fluxes, No 1 or 2, “ two parts. Mix them well together for “ painting.”

Com-

Compoſition of a bright tranſparent green.

N° 23.

" Take of the fluxes, N° 1 or 2, ſix parts, " and of copper precipitated by alkaline ſalts " one part. Mix and flux them till the maſs " be tranſparent."

This will be a very fine deep green, but inclining to the blue, which may be eaſily corrected, when not agreeable to the purpoſe, by the adding a proper quantity of the tranſparent yellows, N° 14 or 15.

Compoſition of a bright tranſparent green by mixture.

N° 24.

" Take of the yellow N° 15, and of the " blue N° 9, equal parts. Levigate them " well together for uſe."

Cheaper compoſition of an opake green.

N° 25.

" Take of the fluxes, N° 1 or 2, ſix parts, " of copper calcined to a purple colour and " of the opake yellow N° 16, each one part. " Mix and flux them well, and then levigate " them for uſe, with one part of the calx " of tin."

Cheaper compoſition of an opake green by mixture

N° 26.

" Take of the yellow, N° 16, and the blue
" N° 9, each equal parts."

By varying the proportion of theſe mixtures, ſea greens, graſs green, or any other teints, may be produced at will.

Compoſition for lighter greens.

N° 27.

" Add the calxes of tin or antimony to any
" of the above, in the proportion the light-
" neſs of the colour requires."

Compoſition for a bright orange colour.

N° 28.

" Take of the yellow, N° 14, two parts, of
" the red N° 1, one part, and of the yellow
" N° 11, half a part. Levigate them together
" for uſe."

N. B. The compoſitions which are not directed to be fuſed when uſed alone, muſt not undergo any in the mixtures to be made of them, but muſt only be levigated with the other ingredients, and uſed for painting in that ſtate.

Compoſition of a bright tranſparent orange.

N° 29.

“ Take of the red, N° 2, and of the yellow “ N° 14, equal parts. Mix them well together.”

Compoſition for lighter tranſparent orange extremely bright.

N° 30.

“ Take of the above and glaſs of antimony “ equal parts. Levigate and mix them for “ uſe.”

When glaſs of antimony is uſed, the fire muſt be ſpared both as to time and degree.

Compoſition of a cheaper tranſparent orange.

N° 31.

“ Take of the fluxes, N° 1 or 2, ſix parts, “ of copper calcined to redneſs one part, and “ of red tartar one part; flux them till the “ matter become tranſparent, but avoid, if “ poſſible, continuance in the fire a moment “ longer; levigate it till it appear red, and “ mix with it an equal part of glaſs of anti- “ mony.”

Compoſition of a bright opake purple.

N° 32.

“ Take of the red N° 1, and the blues
“ N° 6 and 9, each half a part. Mix them
“ for uſe.”

Compoſition of a bright tranſparent purple.

N° 33.

“ Take of the red No 2, and of the blue
“ N° 9. Mix them for uſe.”

Compoſition of a cheaper opake purple.

N° 34.

“ Take of the fluxes N° 3 or 4, ſix parts,
“ of zaffer one part, and of magneſia half a
“ part; fuſe them with a ſtrong heat till the
“ whole be tranſparent, and then add of the
“ red N° 4, one part, and of the calx of tin
“ half a part. Mix and levigate them well
“ together for uſe.”

Compoſition of a cheaper tranſparent purple.

N° 35.

“ Take of the fluxes N° 3 or 4, ſix parts,
“ of magneſia one half part, and of zaffer
“ one ſixth of a part. If a red purple be
“ wanted, omit the zaffer.”

This, and the foregoing, may both be varied, either to a more red or a more blue purple, by diminiſhing or increaſing the proportion of zaffer. If the laſt be wanted more red, it may be mixed with a proper quantity of the glaſs of antimony.

Compoſition of an opake brown colour inclining to red.

N° 36.

" Take of the red N° 3, four parts, and of " blue N° 9, one part. Mix them for uſe."

Compoſition of a tranſparent red brown colour.

N° 37.

" Take of the purple N° 33, and glaſs of " antimony equal parts, and of the yellow " N° 19, one fifth of a part. Levigate them " together for uſe."

Compoſition of an opake olive brown colour.

N° 38.

" Take of the yellow N° 16, two parts, of " the blue N° 9, half a part, and of the red " N° 3, a fourth of a part. Levigate them " together for uſe."

Compoſition of a tranſparent olive brown colour.

No 39.

" Take of the yellow, No 18, one part, and " of the blue, No 9, and glaſs of antimony, " each half a part. Levigate them together " for uſe."

Theſe may all be varied by changing the proportions of the ingredients, or they may be converted into different teints of light browns by adding the due quantities of calx of tin, which may be commixt with them when the mixture is made of the other ingredients, or afterwards.

Compoſition of black moderately hard.

No 40.

" Take of the flux, No 1, ſix parts, of zaffer one part, of glaſs of antimony half a " part, and of the ſcarlet ochre and magneſia " each a fourth of a part. Mix and fuſe them " till the matter become a clear black of the " deepeſt caſt."

Compoſition of a black very ſoft.

No 41.

" Subſtitute flux, No 2, inſtead of No 1, and " proceed as in the laſt."

This compoſition is extremely well accommodated to the painting enamel dial-plates, or painting on enamel or China grounds in the manner of prints, or *chiaro obſcuro*. For as it will run with a very ſmall degree of heat, the ſlighteſt touches may be brought to ſhew themſelves perfectly without the leaſt hazard of fuſing the ground, ſo as to run them together.

The above compoſitions may be diverſified by recompounding them with each other, ſo as to form all the variety of teints to ſuit every purpoſe; and the hardneſs or ſoftneſs of the fluxes may be likewiſe adapted to each occaſion by mixing them together. With reſpect to the proportions in every compoſition, they may likewiſe be varied according to the purpoſes they are uſed for, there being no poſitive rules to be laid down in theſe matters with relation to quantities; for the different degrees in which different parcels of the ingredients poſſeſs the requiſite qualities, as well as many other circumſtances, prevent the effect from being the ſame, even in compoſitions exactly alike, as far as regards the quantities. I have, however, endeavoured to give ſome leading proportions of each kind, by which the neceſſary mixtures may be adjuſted according to every occaſion, by a ſlight conſideration on the properties of the ingredients,

dients, which I have to this end previouſly explained. It is by this knowledge only, and a proper occaſional application to it, that any artiſt can ever arrive at great perfection in the uſe of enamel colours; for the want of it has in general obliged even the moſt ſkilful and experienced, who work in enamel, to adhere in many caſes implicitly and blindly to the ſtrict forms of recipes, where the preparations have by no means been ſo well adapted to their purpoſes as they might have been by ſlight alterations.

SECT. VII.

Of the manner of laying on and burning the enamel grounds.

THE matter of the enamel muſt be firſt finely levigated and ſearced, and the body to be enamelled ſhould be made perfectly clean. The enamel muſt be then laid on as even as poſſible by a bruſh or pencil, being firſt tempered with oil of ſpike, and the diſtance of time betwixt the laying on the ground and burning the piece ſhould not be too great, becauſe the oil will exhale and leave the matter of the enamel a dry incohering powder, which will be liable to be rubbed or ſhaken off by the leaſt violence. This is the common method: but there is a much better way of managing this part of the work by means of a ſearce, in which the enamel is ſpread with very little trouble, and the greateſt part of the oil of ſpike ſaved. The method of performing this is, to rub the ſurface to be enamelled over with oil of ſpike; and then, being laid on a ſheet of paper or piece of leather, to ſave that part of the enamel which does not fall on a proper object, to ſearce the matter upon the oiled ſurface till it lie of a proper thickneſs. But great care muſt be taken in this method of proceeding not to ſhake or move too forcibly the pieces of work thus covered with the powdered enamel.

It is uſual to add oil of turpentine to the oils of ſpike or lavender, in order to make them go further, and ſave the expence attending the free uſe of them; and others add alſo a little olive or linſeed oil, or ſome, in the place of them, crude turpentine. The uſe of the ſpirit of turpentine is very allowable, for it is the ſame for this purpoſe as the oils of ſpike or lavender, except that it wants the glutinous quality which makes them ſerviceable in ſpreading the enamel. But with reſpect to the uſe of the oils of olive and linſeed, or any other ſubſtantial oil, it is very detrimental, tending to reduce the metalline calxes, and leaving a ſmall proportion of black coal or aſhes, which much neceſſarily injure the white colour of the ground.

When plates, as in the caſe of pictures, dial-plates, &c. are to be enamelled, they ſhould always be made convex on the outſide, and concave within; and all pieces of enamel formed of metal, where the figure does not admit of their being thick and ſolid, ſhould be of the ſame kind or form; otherwiſe they will be very apt to warp in the heat, and cannot be brought ſtraight, after they are taken out of the fire, without cracking the enamel. For this reaſon, likewiſe, it is proper to enamel the work all over, as well on the wrong as right ſides, to prevent the heat from calcining the metal, which would both contribute to its warping, and weaken the texture of it.

The enamel being laid on the body to be enamelled, when the fixt muffle is uſed the piece muſt be gently lifted on to the falſe bottom, and put in that ſtate into the muffle fixt in the furnace deſcribed p. 268, by thruſting the falſe bottom into it as far as it will go. But it is beſt to defer this till the fire be perfectly in order, which may be known by putting a bit of tile or China with ſome enamel on it of the ſame tone with that uſed as a proof; and another proof of the ſame kind may be alſo put along with the work into the muffle, which, being taken out, may ſhew how the operation proceeds.

When conſiderable quantities of pieces are to be enamelled, as in the caſe of manufactures, inſtead of putting them into muffles, coffins, or caſſoons, ſuch as are deſcribed p. 276, are to be uſed for expedition, that a great number may be put into the fire together. Where this method is to be purſued, the pieces of work to be enamelled are to be laid on the bottom of the coffin till it be covered; and then the ſecond flooring or falſe bottom is to be fixed in its place, and covered in the ſame manner; after which the lid is to be put on, and well ſecured, in the joints it forms with the ſides of the coffin, by fire-lute. The proof, in this caſe, ſhould be laid on the lid, on the part next the ſide-door of the furnace; and it may be expedient, eſpecially till the working of the furnace, and the kind of enamel uſed be very well underſtood, to have two or three of theſe proofs. The enamel work being put thus into the coffins, they ſhould be ſet on the dome of the furnace, which muſt be of the kind deſcribed p. 272, that they may be moderately heated before they be put into the furnace, which would otherwiſe endanger their cracking. When they are ſo heated, proof having been made by means of a ſmall bit of China, or copper covered with the enamel, that the fire be of a due force, they muſt be conveyed into the furnace through the ſide-door and muſt reſt on the pieces of fire-ſtone placed for that purpoſe on the flooring in the back part of the furnace. It is requiſite, nevertheleſs, that the conveying them into the furnace ſhould be managed with particular care, to prevent the ſhaking off the enamel; and it muſt be done by means of the peel or inſtrument deſcribed page 277, adapted to this purpoſe; on which the coffin being laid, it muſt be gently thruſt into the furnace till the coffin be in its proper ſituation, with reſpect to diſtance from the ſides of the furnace. Then the further end of the peel muſt be turned ſlowly towards the front of the furnace, the coffin being at the ſame time ſhoved off from it by means of the flat end of the tongs before deſcribed, introduced thro' the door for feeding the fire, till it ſtand intirely on the fire-ſtones, after which the peel muſt be withdrawn. The operation being finiſhed, the peel muſt be again introduced under the coffin, by raiſing firſt the neareſt end of it, by means of the tongs, through the door in the front; and afterwards the other parts gradually, till the peel ſupport it. They muſt then be drawn out together, and the coffin may be beſt placed on the dome of the furnace, that, by cooling more gradually, the temper of the enamel may be improved.

If it be required to burn a ſingle piece or two in this kind of furnace, it may be done by means of the common or looſe muffle, deſcribed p. 274. In which caſe the enamel-work being laid on the bottom or flooring of the muffle, and the muffle put over it, the whole muſt be conveyed into the furnace by means of the tongs with turned points, through either of the doors. A proof may be at the ſame time put in, on a piece of tile or ſpare bottom of a muffle, and the proceedings in other reſpects may be the ſame as with the fixt muffle, or the coffins.

Where there is no furnace, and it is deſired to burn enamel work on an open hearth, preparation muſt be made according to the directions in p. 273; and the flooring of the muffle being laid at a proper diſtance from the nozzle of the bellows, the work muſt be laid on it, and covered with the muffle. This being done, pieces of charcoal muſt be heaped over them; and the fire being lighted, muſt be blown up with the bellows, till it be ſufficient to flux the enamel, which muſt be examined by the proof put into the fire along with the work. The coals muſt then be taken off from the muffle, and the muffle, with the flooring and enamelled work, removed out of the fire, but kept near it to prevent their cooling too faſt. If there be more work to be burnt, another muffle, &c. may be immediately put in the place of the other, and the ſame operation repeated; for it is a matter of indifference whether the coals be burning when the work is put on the hearth, or kindled afterwards.

Pit-coal may be uſed in the furnace, where enamel is burnt with the fixt muffle, or in coffins; which is indeed one principal conveniency attending the uſe of them, as it ſaves a conſiderable expence of charcoal.

But where the open muffle is uſed, charcoal alone ſhould be employed, as the fumes of mineral coal are very detrimental to ſome colours, and deſtructive of the grounds, if whitened by arſenic, as the common white glaſs.

SECT. VIII.

Of the manner of laying on and burning the enamel colours.

THE colours being prepared as above directed, muſt be reduced to powder by due levigation and waſhing over, where they are required to be extremely fine, and there is no unvitrified ſalt in the mixture. They muſt then be tempered on a China or Dutch tile with oil of ſpike or lavender, to which moſt artiſts add likewiſe oil of turpentine, and ſome (but I think erroneouſly, as I have before mentioned) a little linſeed or olive oil, and in this ſtate they are to be uſed as paint of any other kind. But it ſhould be avoided to mix more of the colours with the eſſential oils than will be immediately uſed, becauſe they dry away extremely faſt, and would not only be waſted, but give a coheſion to the particles of the colours that would make them work leſs freely when again diluted with the oil.

The colours being thus laid on the pieces to be painted, the proceeding muſt be in all reſpects the ſame as with the grounds, in whatever manner they are to be burnt, either in the muffles or coffins; but greater nicety muſt be obſerved with reſpect to the fire, as the effects of any error in that point are of much greater conſequence in the burning the colours than the grounds, eſpecially if the white of the grounds be formed from the calx of tin or antimony, and not arſenic.

Pit-coal, as was above obſerved, may be employed for burning as well the colours as the grounds where the muffle or coffins are uſed, or any other method purſued that wholly hinders the ſmoke and fumes from having any acceſs to the enamel.

CHAP. XI.

Of the method of painting on glaſs by burning, or with tranſparent colours that vitrify.

SECT. I. *Of the general nature of painting on glaſs with vitreous colours.*

THE art of painting on glaſs with colours that vitrify has been eſteemed, as far as regards the compoſition and burning of the colours, a myſtery known perfectly in the former ages, but loſt in a great degree to the preſent times. It will appear, however, on due examination, that the caſe is far otherwiſe, and that the loſt ſtate of this art is owing to a very different cauſe. It will be proved, that from default of artiſts who cultivate this manner of painting, which probably would not find many patrons at preſent, the dexterity or experience of making an advantageous uſe of the colours, ſo as to form good pictures, is alone wanting. But that as to the knowledge of the preparation of the colours, and the method of burning them, we poſſeſs them from the modern improvements of chymiſtry in a much more extenſive degree than the former times. From whence it may be juſtly concluded, that if any able painters were to apply themſelves to this way of working, undoubtedly much better pictures would be now produced than thoſe we ſo much value as remains of an art of which we miſtakenly ſuppoſe the methods of execution at preſent loſt. The great progreſs which Mr. Paterſon, in Eſſex-ſtreet in the Strand, London, has made in an undertaking to eſtabliſh a manufacture of painted glaſs, is an evident proof of this, ſeveral of the pieces produced by him exhibiting colours in an equal, or, perhaps, much greater perfection than is found in the old paintings. For the ſake therefore of others, who, from views either of profit or amuſement, may chooſe to apply themſelves to the reviving this ſpecies of painting, I will give ſuch lights into the nature of the ſubject, and the manner of purſuing it practically, as may enable any who can paint in oil, water, or other vehicles, ſoon to become maſters of every thing peculiar to this art.

The painting with vitreous colours on glaſs depends entirely on the ſame principles as painting in enamel, and the manner of executing it is likewiſe the ſame, except that in this the tranſparency of the colours being indiſpenſibly requiſite, no ſubſtances can be uſed to form them but ſuch as vitrify perfectly, ſince, without ſuch vitrification, there can be no tranſparency. In other words, the whole myſtery conſiſts in finding a ſet of colours which are conſtituted or compoſed of ſuch ſubſtances, as, by the admixture of other bodies, may promote their vitrification and fuſion, are capable of being converted into glaſs, and melting, when in that ſtate, with leſs heat than will melt ſuch other kinds of glaſs as may be choſen for the ground or body to be painted;—in tempering theſe colours, ſo as to make them proper to be worked with a pencil;—and in burning, or reducing them by heat to a due ſtate of fuſion, without injuring or melting the glaſs which conſtitutes the body painted.

The circumſtances of this art are ſo analogous to thoſe of the art of enamelling, that the ſame means will, as I have before intimated, ſerve for almoſt every particular purpoſe that occurs in the proſecution of it. I have therefore but little occaſion to enter into the detail either of the preparation of the colours or the uſe of them; as it will be ſufficient to refer for moſt particulars to what has been before ſaid, and only to ſhew how the methods there taught are applicable to this intention.

SECT. II.

Of glaſs as a ground for painting with vitreous colours, or by burning.

THE firſt object to be regarded is the choice of grounds, which ſhould be plates, or veſſels of glaſs, that is of the firſt degree of hardneſs, but at the ſame time colourleſs, and without ſpecks or wavings. The glaſs which has theſe qualities, in the greateſt degree, is the beſt of the kinds of that uſed for windows, except ſuch as is made for looking-glaſſes, which, though moſt colourleſs and clear, is ſofter, from the quantity of borax and other fluxes which enter into its compoſition. This ſort, which is called crown glaſs, being a glaſs of ſalts, is hard and tranſparent, and, being ready formed into plates, may conſequently be had in a ſtate proper for uſe. But where paintings of any conſequence are undertaken, a compoſition ſtill better ſuited to this purpoſe ſhould be employed, and the glaſs wrought in the ſame manner as the looking-glaſs plates alone are at preſent.

When larger objects are to be depicted than the ſize of ſingle plates of glaſs can contain, it is practiſed to join ſeveral ſquares together, which may be prepared for the painting in this manner: An even board of the ſize of the whole of the plates laid together, ſhould be ſprinkled with a mixture of reſin and pitch, which being melted by a flat iron held over it, the plates of glaſs ſhould be placed on the board as cloſe to each other as poſſible, and will be firmly fixt in the ſituation they are laid, by the cement of reſin and pitch as it cools. The glaſs being ſo fixt, muſt be cleaned from any of the cement which may have run through the joints, firſt by ſcraping, and after by rubbing with ſpirit of turpentine. It will then be in a condition to be painted with the ground colours, which being performed, the plates may be taken off the board by paſſing the flat iron heated over them at a proper diſtance, which melting the cement, will let them looſe from the board, and they may then be burnt ſeparately without any inconvenience. They may then again be fixed on the board by means of the cement, and the painting completed, or proceeded with to the degree that requires another burning.

SECT. III.

Of the fluxes and colours to be uſed in painting on glaſs by burning.

THE ſame ſubſtances and manner of preparation of fluxes and colours, which ſerve for the purpoſes of enamelling, will ſerve equally well for the purpoſes of painting on glaſs by burning, except, as was before obſerved, that all thoſe bodies which will not perfectly vitrify with ſuch a force of flux and heat, as can be applied expediently with reſpect to the glaſs which forms the ground painted upon, muſt be wholly omitted.

I ſhall therefore wave any particular inſtructions for the preparations of the fluxes and colours for this kind of painting as needleſs repetition, and only enumerate the compoſitions before given, which are proper to be uſed in each intention, by referring to the numbers prefixed, and ſubjoining directions for the particular treatment of them, when applied to this end, where any ſuch is neceſſary.

The fluxes above given may be uſed as there prepared, and the ſame diſcretion muſt be exerciſed in adjuſting the ſtronger or weaker to the ground as in the caſe of enamel. But if the hardeſt of the two kinds of fluxes ſhould be found too ſoft in any inſtance of its application, it may be mixed with a due proportion (which muſt be found by trial) of the glaſs of the ground levigated to perfect fineneſs.

To produce white in this kind of painting, the artifice of leaving the ground unpainted, or ſlightly obſcured where a fouler teint is wanted, muſt be uſed inſtead of an actual white body, unmodified light tranſmitted through the glaſs ſupplying the place of the reflected, and with the ſame effect in theſe circumſtances as the reflected in the others.

The lighter teints of all the colours, ſuch as roſe, or pink colour of crimſon or ſcarlet,—carnation of orange,—ſtraw colour of yellow,—and ſky colour of blue, muſt be produced on the ſame principle as white, by laying on a leſs body of the colour, and conſequently ſuffering it to be diluted by the light paſſing through the glaſs, inſtead of that reflected when bodies are mixt with the colours. The method of effecting this muſt therefore be either to ſpread the colours thinly on the ground, or when the compoſitions given appear to have yet too great a body, to dilute the colour by mixing with it an additional quantity of flux; or, if that render the mixture too ſoft, of levigated glaſs the ſame with the ground. In this manner, teints of all degrees of lightneſs may be produced with equal certainty and eaſe, as by the addition of white in enamel and other

kinds

kinds of painting; and with this further advantage, that, if the colours are wanting in brightneſs, they yet bear up and ſupport their force much more than thoſe equally foul would in the other method of uſe. I ſhall therefore omit any directions for the producing the diluted colours, (that is to ſay, thoſe which in other kinds of painting are to be formed by the addition of white) as likewiſe all ſuch others as are to be obtained by the compoſitions above exhibited in treating of enamel, and proceed only to enumerate them, ſubjoining only remarks on a caſe or two where they are peculiarly material.

For a bright red, take N° 2, which will be crimſon or purple, according to the colour of the gold uſed;—for a fouler red, take No 4; but it is extremely tender, and muſt not be run to perfect fuſion, nor continued long in the fire:—when a more ſcarlet red is wanted, mix No 2 with glaſs of antimony.

For a very bright blue, take N° 6, rendered perfectly tranſparent by fuſion. But this being formed of ultramarine, which, when good, is of very high price, the uſe of it may in moſt caſes be avoided by ſubſtituting the following compoſitions, as the effect which colours have in this way of painting is ſo advantageous, even to thoſe that are fouler, as renders brightneſs of leſs conſequence than in any other caſe: —for a full blue, which will not be wanting in brightneſs, but rather inclining to warmth, take N° 9:—for a very cool blue, take N° 12, without the calx of antimony or tin:—for a truer blue than either of the laſt, mix them in the proportion that will produce the teint deſired; but the blue of N° 12 verges more towards the green, than in proportion to the warmth of N° 9, when good.

For every bright yellow, take N° 14, without the calx of antimony or tin, or N° 15:—for a cheaper yellow, take N° 18:——for a cheap warm yellow, N° 19.

For a very bright green, take N° 18, prepared tranſparent, and N° 14, without antimony, and mix them in that proportion which will render the green produced more inclining to the blue or yellow, according to the occaſion; but this compoſition being expenſive on account of the ultramarine in N° 14, and extremely great brightneſs being ſeldom eſſential, as was before obſerved, in this kind of painting, the following may, in moſt caſes, be ſubſtituted for it to advantage:—for a cheaper bright green, take N° 23, with the addition of a proper quantity of N° 18, if it be required to incline more to the yellow:—for a cheap, but leſs bright green, take N° 9 and N° 18, and mix them in the proportion to form the teint wanted.

For a bright orange colour, take N° 2 and N° 14, without antimony:—for a cheaper, but more diluted orange, take glaſs of antimony, or a mixture of it with the foregoing:—for the diluted orange, called *carnation*, take glaſs of antimony ten parts, the purple of N° 35, the zaffer being omitted in the preparation of it, one part, and mix them with the fluxes N° 1 or 2, according to the body of the colour deſired.

For black, take N° 40 or 41.

For a red brown, take N° 37 :——for an olive brown, take No 39 :——or foul any of the reds or yellows before given with a due proportion of black.

From the combinations of ſome of theſe, all the other variety of teints, both with reſpect to difference of hue or of lightneſs of colour, may be produced ; and, if the manner of painting ſhould ever make it neceſſary to diminiſh the tranſparency of any of them, it may be done by adding a ſmall quantity of any of the compoſitions for white enamel, in that proportion which will produce the effect deſired.

SECT. IV.

Of the manner of laying the colours on glaſs grounds, and burning them.

THE ſame affinity betwixt painting in enamel and on glaſs by burning, which renders the preparation of the colours ſo much the ſame in both, extends itſelf alſo to the manner of laying the colours on the grounds, and burning them.

The manner of tempering the colours, and painting with them on glaſs, may therefore be exactly the ſame as was before directed for enamel; the oils of ſpike or lavender, and of turpentine, being alike ſuitable in this caſe as in the other. But with reſpect to the manner of burning the colours, though the general methods muſt be the ſame, yet a variation in certain particulars is in ſome caſes neceſſary, which I ſhall therefore take notice of here.

Smaller plates, or other figured bodies of glaſs, may have the colours burnt in the fixt or looſe muffles; but larger plates require coffins, which may be formed in the ſame manner as was directed for enamel. Though, as the form of the plates in this caſe are flat, and not convex, as is neceſſary in the other, a number of layers or ſtrata may be put into the ſame coffin; for it is not material how near the ſurfaces of the plates are to each other, provided they do not touch. The beſt method of placing them to advantage in the coffins is to have iron plates adapted to the coffins. Theſe iron plates ſhould have at every corner a ſmall bit of iron going off at right angles, that the plates being put over each other may be ſupported by theſe bits of iron acting as ſhort pillars, and kept at ſuch diſtance from each other, as will ſuffer the glaſs to lie betwixt them clear of all contact with any other body, as far as regards their upper ſurface. The bottom plate, nevertheleſs, muſt have no pillars, as there will be nothing under it but the ſubſtance of the coffin. Theſe iron plates muſt be made ſo much bigger than the plates of glaſs that the latter may lie upon them clear of the pillars, which ſhould reſt on the iron plates under them, and not on the glaſs. The iron plates being in this manner adapted to the coffins, the bottom muſt be put into it, and one of the plates of glaſs laid upon that, but at ſuch an exact diſtance from each ſide, that the pillars of the next iron plate may not reſt upon it, but on the bare part of the iron plate under it. Another plate of glaſs muſt be then laid in the ſame manner on this plate of iron, and the ſame proceeding continued till the coffin be filled; then the lid muſt be luted on, and the ſame method obſerved in all other particulars as was before directed for the burning enamel paintings. As there may be occaſion, however, to uſe larger coffins for painted glaſs than enamel, the dimenſions of the furnace muſt, when ſuch are wanted, be varied accordingly. But it will not in this caſe be neceſſary to inlarge the area of that part of the furnace which contains the fuel in depth; for, if it be increaſed in length, from ſide to ſide, in proportion to the increaſed magnitude of the coffins, it will ſufficiently augment the body of fire.

CHAP. XII.

Of gilding enamel and glaſs by burning.

THERE are two methods of gilding enamel and glaſs by burning or annealing; the one is the producing a coheſion of the gold with the glaſs or enamel, by the intermediate of a flux; the other by producing the like effect without any. But the principle is the ſame nevertheleſs in both; and is in fact no other than the cauſing the gold to adhere to the enamel or glaſs, in conſequence of the fuſion or approach to that ſtate, either of the flux uſed, or the body of enamel or glaſs itſelf, by which the gold is cemented to ſuch body.

The flux, when any is uſed, may be either ſimple glaſs of borax, or any of the above directed preparations of fluxes powdered.

There are other differences likewiſe in the manner of this gilding, which reſpect the ſtate of the gold; for it may be either uſed in the form of leaf gold, or in that of powder, either mechanically made, or by precipitation.

When leaf gold is employed for gilding enamel or glaſs, in this way, without any flux, the enamel or glaſs may be moiſtened with a very weak ſolution of gum Arabic, and again dried. Being ſo prepared, it ſhould be breathed upon till it become a little adheſive or ſticky, and then it ſhould be laid upon a leaf of gold; and if that be not ſufficient to cover it, the remaining part muſt be laid on others, and the work afreſh breathed upon, if it appear dry before the whole ſurface be gilded. When the gold is thus united to the enamel or glaſs, by the cementing quality of the gum Arabic, which is uſed in order to keep it cloſe and even to the body to be gilded, the work is ready for burning.

If the leaf gold be uſed for gilding enamel or glaſs with the aid of any flux, ſuch flux, being finely levigated, ſhould be tempered with a very weak ſolution of gum Arabic, and very thinly ſpread on the part of the work to be gilded; and when the gum water is near dry, the leaf gold ſhould be laid on the part thus prepared for it; or if the work be kept beyond the time, it muſt be breathed upon till it become ſticky; the gold thus fixed on the work, it is in a ſtate proper for burning.

The advantage in omitting to uſe any flux is the rendering the gold leſs prominent and uneven, with reſpect to the body gilded, which is in ſome caſes material. But unleſs the ground, whether of enamel or glaſs, be very ſoft, it requires a ſtrong heat to make the gold take hold of it; and this, in the caſe of enamel, endangers the ground, or any painting upon it; for, if the degree of heat be not very nicely adjuſted, the glaſs or enamel will run into too liquid a ſtate in ſome inſtances, and in others not be ſoftened ſufficiently to cohere with the gold. The advantage of uſing a flux lies in avoiding both theſe inconveniences; and particularly in the caſe of very hard glaſs, the being certain that the gold will cake; which is, without this medium, ſometimes dubious. But the flux lying under the gold, prevents it neceſſarily from being ſo level with the ſurface, or having the ſame evenneſs as when laid on the body itſelf without any intermedium.

Before we ſpeak of the method of uſing the gold in powder for gilding in this way, it is proper to mention the manner of preparing this powder, which may be beſt made in the following manner:

" Take any quantity of gold, and diſſolve
" it in *aqua regia*, according to the directions
" given in p. 289, in the proceſs for making
" the *calx caſſii*, or gold purple. When it
" is diſſolved, make a precipitation of the gold,
" by putting into the ſolution ſlips of copper
" plate, which muſt be continued there till
" they no longer produce any efferveſcence
" in the fluid. Theſe ſlips of copper being
" then taken out, and the gold adhering to
" them gently beaten off, the fluid muſt be
" poured off from the precipitate, and freſh
" water put into its place, which muſt be re-
" newed in like manner ſeveral times, till
" the ſalt formed by the copper and *aqua re-*

“ *gia* be intirely waſhed from the gold; “ which being dried will be ready for uſe.”

The precipitation may otherwiſe be made by adding a ſolution of Roman vitriol, or of copperas, or common green vitriol, to the ſolution of gold, as was above directed p. 293, and, indeed, this method is more expeditious, as the precipitation is inſtantaneouſly made. In the preſent practice, the *aurum fulminans*, or precipitation by alkaline ſalts, is made by thoſe who gild glaſs in the greateſt perfection of any here, and the volatile alkali is employed for the precipitation by the chymiſt who prepares it for this purpoſe; but when this kind of precipitate is choſen, the uſe of any flux muſt be avoided, and a very conſiderable degree of heat applied.

Where it will not anſwer the trouble to prepare precipitated powders, that formed of leaf gold, in the manner below taught, may be uſed in its place; but the precipitates are more impalpable powders than can be obtained by any different method, and will take a finer burniſh than any other kind, when employed in this ſort of gilding.

The manner of uſing the precipitates of gold in gilding of glaſs or enamel, except with reſpect to the *aurum fulminans*, may be varied two ways as well as that of the leaf gold, viz. by adding to it, or omitting any flux. The convenience of uſing flux is the ſame with that before mentioned, with the further advantage of rendering the gilding extremely durable, even to a degree of bearing to be ſcraped; but the diſadvantages are greater, for not lying under the gold, as in the other caſe, but being mixt with it, the flux deſtroys the rich metalline look, and what is ſtill much worſe, in many caſes prevents its taking a burniſh with the true luſtre.

In which way ſoever the powder is uſed, it is to be tempered with the oil of ſpike, and worked as the enamel colours, and the quantity of flux, when any is uſed, may be a third of the weight of the gold. When the gold is thus laid on, the work is ready for burning, which operation muſt be performed in the ſame manner, excepting what regards the degrees of heat in all the different methods of gilding that have been here mentioned.

In caſes where the glaſs is very hard, or where the opportunity of a ſtrong heat cannot be conveniently obtained, the expedient of uſing a flux in the following manner may be adopted with great advantage.

" Grind glaſs of borax to a fine powder, " and, having tempered it with oil of ſpike, lay " it on the glaſs where the gilding is to be " made. Burn then the glaſs with the degree " of heat that will run the borax, and when " it is cold apply the precipitate, or leaf gold, " and burn it again as in other caſes."

In this manner the advantage of a flux may be gained, without the inconveniences before mentioned, and the gold will take with a very gentle heat. It is, indeed, attended with double trouble and hazard; but in the caſe of uſing leaf gold, where a very good burniſh may be wanted, this method will perhaps be found, on the whole, the moſt eligible.

The manner of proceeding for burning or annealing the work in this kind of gilding is the ſame with the treatment of the enamel, or glaſs in the uſe of the colours, except that the pieces may either be put into the muffles or coffins; or, in the caſe of the glaſs, if there be no painting, the operation may be performed in the naked fire.

After the work is burnt, if it be deſigned to be burniſhed, a proper luſtre may be given to it by rubbing the gilded part with a dog's tooth, or with a fine agate, or iron burniſher.

CHAP. XIII.

Of the taking off mezzotinto prints on glaſs, and painting upon them with oil, water, or varniſh colours.

THE painting on glaſs by means of mezzotinto prints is performed by transferring the ink of the print to the ſurface of a glaſs; and thus, having obtained a drawing, colour it by proper pigments tempered with oil, varniſh, or oil of a vehicle. This tranſferring the ink from the print to the glaſs is effected by cementing the face of the prints to the ſurface of the glaſs, by means of ſome glutinous body which will not diſſolve in water, and then deſtroying the texture of the paper by water, ſo that it may be rubbed intirely off from the cement upon the glaſs, leaving, at the ſame time, the whole of the ink of the print upon the cement and glaſs, in the ſame manner as if the original impreſſion had been made there.

The particular method of performing this is as follows.

Procure a piece of the beſt crown glaſs, as near as poſſible in ſize to the print to be taken off, and varniſh it thinly over with turpentine, rendered a little more fluid by the addition of oil of turpentine. Lay the print then on the glaſs, beginning at one end, and preſſing it gently down in every part in proceeding to the other. This is requiſite to prevent any veſicles of air being formed in the laying it on, by the paper touching the cement unequally in different parts, and to ſettle the whole more cloſely to the glaſs, it is well to paſs over it a wooden roller of about the diameter of two inches. dry then the glaſs, with the print thus laid upon it at the firſt, till the turpentine be perfectly hard, and afterwards moiſten the paper well with water till it be thoroughly ſoaked. After this, rub off the paper intirely from the cement, by gently rolling it under the finger, and let it dry without any heat; the impreſſion of the print will be found perfect on the glaſs, and may be painted over with either oil or varniſh colours.

The choice and treatment of the colours for painting in this way upon glaſs, in either oil or varniſh, may be the ſame as for any other methods, and it is therefore needleſs to enumerate any further particulars, but to refer to the parts of this work where the nature and preparation of them, as well as the manner of compoſition with the oils and varniſh, is before explained.

CHAP. XIV.

Of colouring or waſhing maps, prints, &c.

THE colouring maps, or other prints is performed either by ſpreading opake colours ſo thinly on the ſubject that the full effect of the printing may appear under them, or by uſing tranſparent colours, which ſtain the ground and dry away without leaving any opake body; this laſt method is called *waſhing*.

The uſing opake colours, or ſuch as have a ſolid body, in this way on prints, depends intirely on the kind of vehicle uſed; for if the colour be ſuſpended by the vehicle, that it can be ſpread ſo as to lie in the moſt ſparſed, and yet equal manner, it may be applied to this purpoſe with ſucceſs, and ſuch as are very ſtrong and bright, even though of the moſt opake body, as vermilion, verditer, ultramarine, or turpeth mineral, will anſwer the end. The beſt method of doing this is the uſing the iſinglaſs ſize, as I before intimated, prepared with ſugar or honey, according to the directions given in p. 180, which makes the colours of this ſort work ſo freely, that they may be diffuſed almoſt as eaſily as the tranſparent kinds, and with nearly as good effect. The proportion of the ſtrength of the ſize to each particular ſort is likewiſe beforementioned in p. 185, and it is therefore unneceſſary to give it here; but it is proper in moſt caſes to dilute the compoſition more for the waſhing maps, and ſpreading the colour over large ſurfaces, than when employed in painting.

Beſides the opake, there are a number of colours which are ſemi-tranſparent, and yet have a body in a greater or leſs degree. Theſe are carmine, biſtre, and gall-ſtone, in the firſt degree; with lake and Pruſſian blue in the ſecond; all which may be treated in the ſame manner, but require very different proportion in the ſtrength of the ſize; for the firſt of theſe claſſes ought to have as little as poſſible of the ſize, and the latter to be more copiouſly furniſhed with it.

The tranſparent colours ſhould be preferred for this purpoſe to either of the other kinds, as their effect is better, and they require no preparation. The colours are,—*for red*, red ink;—*for blue*, litmus;—*for green*, ſap green and verdigriſe (in vinegar);—*for yellow*, gamboge, the yellow berry waſh, and turmeric waſh;—*for purple*, the logwood waſh, and archal;—*for brown*, Spaniſh liquorice; and *for black*, Indian ink. Theſe require only to be diſſolved in water, which ſhould be more copiouſly added where they are employed for waſhing prints, or colouring large grounds of any kind.

With reſpect to the manner of uſing any of theſe claſſes in the colouring maps and prints, there is nothing more required than in any other painting, except that it muſt be carefully obſerved, in employing the opake or ſemi-tranſparent colours, never to cover any parts ſo ſtrongly with them as to prevent the diſtinct appearance of the ſhades of the printed deſign, as they are to ſhew themſelves through the colours, and form the ſhades of the picture made by the colouring.

In the *illuminating* (as it is called) maps, as little peculiar in the manner is neceſſary as in the caſe of other prints; only, the intent of colouring them being to diſtinguiſh the diviſions of the maps with reſpect to countries, diſtricts, &c. care muſt be taken not to lay the fluid colours on ſo copiouſly as to flow beyond the limits of what they are intended to cover. The reſt depends on the diſpoſing of the variety of colours ſo in different parts as to give them a ſtrong and pleaſing effect, which muſt depend more on fancy and good taſte than on any rules. There is indeed one thing in particular, which it may be proper to remark, ſhould be always avoided ; it is the laying thoſe colours that have any affinity or likeneſs cloſe to each other ; for by an error in this particular they will be rendered much leſs effectual with reſpect to the purpoſe they are to ſerve, as it is by ſuch a diſpoſition made more difficult to the eye to diſtinguiſh the limits and bounds they are intended to mark out. And moreover, for want of due appoſition, the diverſification of the colours is made leſs pleaſing when they are ſeen at a diſtance, and conſidered only with reſpect to their ornamental appearance. There is one other rule I will likewiſe recommend the obſervance of, though many think they are giving moſt perfection to their work when they moſt deviate from it ; it is, the never uſing too ſtrong and deep colours for this purpoſe, as they render the legible characters of the maps leſs diſtinct and perceptible. Such a practice is therefore repugnant in a certain degree to the principal intention of the maps, and moreover gives them a tawdry glaring appearance, which is very inconſiſtent with good taſte ; one great principle of which is ſimplicity, and the avoiding a falſe and unmeaning ſhowineſs.

PART II.

Of the ſeveral arts uſed in making outline ſketches of deſigns from nature, or depicted repreſentations, and of the means of taking caſts and impreſſions from figures, buſts, medals, leaves, &c.

CHAP. I.

Of the devices employed for the more eaſily obtaining a juſt outline in making deſigns from nature, and the various methods of off-tracing, calking, and reducing pictures, prints, or drawings.

THE drawing accurately and readily after nature, and depicted repreſentations, by the unaſſiſted hand and eye, requires greater practice and command of pencil than fall to the ſhare of many, who, nevertheleſs, may not want abilities to colour or ſhade a picture or drawing when a proper outline ſketch is previouſly procured. The convenience of quicker diſpatch is moreover a matter of importance even to thoſe who are moſt expert in this art. On theſe accounts, various means have been deviſed to lead and direct the eye or hand, in forming juſt outlines of the principal objects which compoſe the deſign. Theſe means conſiſt of a multiplicity of methods, founded on different principles.

In the drawing after nature, the interpoſing a tranſparent plane is commonly practiſed; through which plane the objects being ſeen from a fixed point of view, the outlines of their parts are traced upon it by chalk or ſome kind of crayon;—or ſuch tranſparent body is divided into ſquares, through which the objects being viewed, the eye may be enabled to form and diſpoſe them with more certainty, on a paper or other proper ground, divided into a ſimilar number of ſquares;—or ſome reflected image is obtained by means of a *camera obſcura*, which affords an opportunity both of drawing the figure, and imitating the natural colour of the objects. Theſe are the devices employed for drawing after nature; but, where pictures, prints, or drawings, are to be copied, a much greater variety are uſed. The moſt common method is by *off-tracing*, as it is called, which is the laying ſome tranſparent ſubſtance over the picture, print, or drawing, and paſſing over the outlines of the principal parts with a pencil or crayon, which delineation is to be afterwards transferred from this tranſparent body to the ground intended for the painting or drawing. The ſecond method, which is indeed only another kind of off-tracing practiſed ſometimes in the caſe of prints and drawings, is effected by laying the originals on the ground of paper or vellum deſigned for the copy, the back of the original being ſmeared with black, or with vermilion, mixed with a little butter, or a paper ſo prepared being laid betwixt the original and copy, and tracing over the principal parts of the deſign with a needle, or ſome other ſuch like inſtrument, by which means an outline ſketch of it will be formed on the ground of the copy. This method is called *calking*, and is performed alſo in another way, by puncturing or pricking the original print or drawing, and producing an outline on a new ground, by tranſmitting a coloured powder through the punctured holes. The third is by diſſolving part of the printing ink by means of ſoap, and impreſſing it on a freſh ground in that ſtate. Another method much practiſed, is the uſing ſquares in the manner above ſpoken of, in the expedients for drawing after nature, except that here they are to be laid upon the picture. This method is likewiſe applied to the more certain copying of pictures or drawings, where the new deſign is to differ in magnitude from the original, in which caſe it is called *reduction*. For the anſwering this laſt purpoſe, there is likewiſe another method,

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by means of a machine I ſhall below deſcribe, for off-tracing, in a manner, where, by ſimply drawing over the lines of the original, the new ſketch may be made greater or leſs at pleaſure.

The particular manner of uſing the tranſparent plane for taking deſigns from nature, is, by framing a piece of tiffany or fine lawn of the ſize of the picture or drawing intended, and fixing it ſo that the whole view of what is to be painted may be ſeen through it; a ſight-board, that is, a flat piece of wood, with a hole in it, being placed parallel to the tiffany or lawn in ſuch manner, that the eye may command the whole view through it, at the ſame time that the hand may reach with convenience to draw upon it. The outlines of the object as they appear through the hole in the ſight-board, muſt then be traced out on the tiffany or lawn, by a crayon formed of white or red chalk, charcoal, or any proper ſubſtance, by which means a ſketch of the deſign will be produced. In order to form a more complete drawing from this crude ſketch on paper or vellum, the tiffany or lawn containing it muſt be carefully laid on ſuch paper or vellum in an horizontal poſition, and, being well fixed down upon it, muſt be ſtruck with ſome flat body in every part; by which means the chalk or matter of the crayon will be transferred from the old to the new ground, and produce the ſame delineation of the object upon it as was before on the other. The impreſſion, thus made on the new ground, ſhould be then over-traced with a black-lead pencil, and afterwards corrected, if there be occaſion, from the natural view through the ſight-board, and this paper or vellum will then contain a proper outline drawing, if the deſign was intended for a painting in water colours. But when this method is purſued with a view to a painting in oil, the tiffany or lawn, after the ſketch is drawn, muſt be laid upon the ground of the intended picture, and proceeded with in the ſame manner as with the vellum or paper, only in this caſe the over-tracing muſt be made with ſome kind of crayon inſtead of the black-lead pencil.

It is adviſed by ſome to uſe paper made tranſparent by means of oil of turpentine, inſtead of the tiffany and lawn; but the uſe of it is only practicable in this way in a darkened room, or other confined place, and the paper thus prepared does not become tranſparent enough, even then, to ſhew minute or remote objects ſo diſtinctly as is neceſſary. If, however, any chooſe to uſe it, the uſual preparation of the paper is only to bruſh it ſeveral times over with oil of turpentine, and to ſuffer it to dry. The tranſparency will be much improved, if a third of nut or poppy oil be added to the oil of turpentine, or otherwiſe a

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little crude turpentine or colourleſs varniſh, any of which will render the oil of turpentine more efficacious for this purpoſe, and ſave the trouble and expence of rubbing the paper ſo often over as is otherwiſe neceſſary. The paper employed for this purpoſe ſhould be that called *fan-paper*, which is to be had of the fan-makers; or, if that cannot be procured, fine poſt paper may be ſubſtituted; and where the deſign is too large to be contained in one ſheet, ſeveral may be joined together, by laying the edges of the ſheets a very little over each other, and cementing them by iſinglaſs glue, which, if neatly done, will effect the tranſparency in the joints but in a very minute degree. When the original ſketch is made on tranſparent paper, the traceing or drawing may be performed by a black lead pencil inſtead of a crayon, which renders the drawing much more perfect and durable; and, being thus completed, it may be uſed for off-tracing the ſketch on any ground intended for a painting in either oil or water. If it be intended for a picture in oil colours, the back of the paper may be ſmeared with pounded black lead, charcoal duſt, or any powdered crayon; or, what is much better, vermilion mixed with juſt ſo much butter as will make it adhere to the paper. It muſt then be laid on the ground of the picture, and over-traced by a copper or iron ſtiſt, or blunted needle, which will make an impreſſion of the ſketch on the ground, by means of the colour on the back of the paper; or another paper may be coloured with the black lead or vermilion, inſtead of the back of the tranſparent paper, and being laid betwixt that and the ground will anſwer the ſame end. The means are no way different where the ſketch is to be tranſmitted to paper inſtead of oil. But in colouring the back of the tranſparent paper, or that interpoſed where any ſuch is uſed, care ſhould be taken that the colour be ſo wiped off as not to ſmear the ground, or produce any effect, except where compreſſed by the inſtrument in the over-tracing, and this indeed ſhould be regarded to a certain degree even with the oil ground. Where the ſketch is large and made on ſeveral ſheets of paper, it is convenient to have weights to place on the four corners of the conjoined ſheets, to keep them even and ſteady on the ground. They are beſt formed of ſquare pieces of lead with handles, and may be about two or three pounds weight each.

The ſketch or tranſparent paper may be otherwiſe tranſmitted to any ground by puncturing it with holes made near each other in the lines of the drawing, and then fixing it on the ground, and duſting over it black lead or any other coloured matter finely powdered, and tied up in a fine linen cloth. This duſt paſſing the holes of the pricked paper, will delineate the ſketch on the new ground, ſo that it may then be over-traced by any kind of pencil or crayon. Glaſs has been alſo uſed in the ſame view as the lawn or tranſparent paper; but its texture hinders it from being well managed with chalk, or any crayon or pencil; though there is a method that has not, as far as I know of, been hitherto practiſed, by which a ſketch might be well obtained by the uſe of glaſs. This method is, by drawing the outlines of the objects with black colour in drying oil, and, when the ſketch is finiſhed, laying the paper intended to receive the copy gently, and without any rubbing or ſhifting on the glaſs, having firſt moiſtened it with water; by which means the black paint will be tranſmitted to the paper, as the moiſture exhales from it, and an impreſſion made ſufficiently exact for the purpoſe.

The manner of aſſiſting the eye, in deſigning from nature by means of a plane divided into ſquares, is by drawing croſs-lines parallel to each other on a tiffany or lawn framed, or on tranſparent paper or glaſs. This may be done with common writing ink, or any other way that will render the lines viſible, and the divided plane muſt be then placed before the ſight-board in the ſame manner as was before directed for tracing the outlines. The ground on which the ſketch is intended to be taken muſt be alſo formed into an equal number of ſquares, and the objects being ſeen through the ſquares of the tranſparent plane, will by this means be much more eaſily diſpoſed in their proper ſituation, and formed of a juſt magnitude, by placing them in the correſpondent ſquare of the ground, than where the eye had no ſuch medium to compare and judge by. But though the above ſubſtances are moſt commonly uſed, there is a more ſimple and effectual way of doing this, which is by making a frame of a proper ſize, and dividing the area, which it forms into ſquares, by threads of a moderate thickneſs. In which way, the objects to be drawn are conſequently more within the power of the eye than when the moſt tranſparent body is uſed. The drawing by the aſſiſtance of ſquares, to thoſe who have the leaſt command of hand, is by much the moſt expedient way. But in order to render this, or the other methods more commodiouſly practicable, where it is to be done in the open air, a portable machine ſhould be made for ſupporting the frame of the tranſparent plane and the ſight-board. This machine may be conſtructed by joining three long legs together, in the manner of the ſurveyor's inſtruments, in a block, and fixing the frame, by means of a foot which will ſlide into the ſame box, that it may be raiſed higher or lower. The ſight-board muſt have a foot likewiſe, by which it may be raiſed higher or lower; though this muſt not be fixed into the block, but into a ſliding-piece, which muſt paſs through the block horizontally; ſo that the foot of the ſide-board being fixt into it at right angles, the board may be brought nearer to, or drawn farther from the tranſparent plane at pleaſure.

The ſecond method uſed to facilitate the drawing after nature, to wit, by the reflected image of the object, is performed by the *camera obſcura*, of which a portable kind adapted to this purpoſe is commonly made by the opticians. It is needleſs, therefore, to give any deſcription of theſe inſtruments; and the ſtructure of them immediately explains the manner of their uſe on a very ſlight examination. Where they are not at hand, and a proſpect through any particular window is deſired to be taken, an occaſional camera may be formed. This is to be done by boring a hole through the window-ſhutter at a convenient height, and putting one of the glaſſes, called the ox-eye, into the hole; when, all other light being ſhut out, except what paſſes through this hole, and a proper ground of paper or vellum, &c. being held at a due diſtance from the hole, the reflected image of the proſpect will be formed upon the ground. If this ground be formed of paper, and fixed ſteady by a proper frame, the image will appear very perfectly on the reverſe or backſide of it, and the artiſt may ſtand at the back and trace the outlines of the neceſſary parts with great convenience, and may even ſtretch the colouring, if he think it expedient.

Though the taking views of nature by the camera has ſeveral conveniences, and ſeems very advantageous, yet there is one very material objection to its uſe. This is, that the ſhadows loſe their force in the reflected image; and objects, by the refraction, are made to appear rounder, or different ſometimes both in their magnitude and ſite, from what they really are, which being oppugnant to the truth of any drawing, almoſt wholly deſtroys the expedience there would be otherwiſe found in this manner.

The method of making ſketches of outlines from pictures, prints, or drawings, by off-traceing, is performed by a variety of methods. The moſt common, where the ſize of the painting does not forbid it, is to take a ſheet of paper prepared by oil of turpentine, or the other means, as above directed for the taking views from nature; and, having faſtened it even on the picture or print to be copied, to trace over the principal parts with a black lead pencil. By this means an outline being obtained, it may be imparted to any other ground, in the manner before deſcribed, when the ſame kind of outline is formed by drawing after nature. Where larger pieces are to be copied, lawn and tiffany may be uſed inſtead of the tranſparent paper; or ſeveral ſheets of the paper may be joined together by means of iſinglaſs glue; and when the outline is traced by chalk, or other proper crayon, the ſubſequent proceeding may be the like alſo, in this caſe, as above, where the ſame kind of outline is taken from nature. Goldbeater's-ſkin, and horn as prepared in plates for lanthorns, as alſo the talc or foſſible iſinglaſs, and dried hog's bladder, have been likewiſe applied to this purpoſe. But where horn, or iſinglaſs are uſed, being rigid bodies that will not yield to impart an impreſſion by re-tracing, they may be beſt treated in the manner above adviſed, in the caſe of glaſs, when employed for taking views from nature; which is, by tracing the outlines with black in oil, and printing a new ground of paper with it.

Another common method of off-tracing, in the caſe of prints, or drawings, is to fix them againſt a window, or other hard tranſparent body placed in a ſtrong light, in a perpendicular poſition; and put a piece of paper, vellum, or any other body ſufficiently tranſparent, before them, to perform the off-tracing, by the view which is this way given of the objects in the print or drawing.

The other method of off-tracing, called *calking*, which is ſometimes practiſed in the caſe of prints and drawings, is performed by tracing on the print, or drawing itſelf, inſtead of the tranſparent body laid over it, as in the other manner. The back of it muſt be previouſly prepared, by rubbing it over with black lead powder, or other ſuch matter; or a paper blacked on the under

der ſide may be uſed inſtead of blacking the print or drawing. By either of theſe methods an outline will be made on any ground of vellum or paper laid under the print, and if ſeveral grounds of very thin paper be laid together under the print, with each a blackened paper over them, ſo many impreſſions may be made at one time. The ſame effect may be produced by puncturing or pricking out the proper outlines in the print or drawing, and then uſing it for imparting the ſketch to another ground, with the black lead powder, &c. in the manner above deſcribed in ſpeaking of the uſe of the oiled paper. When the print or drawing is thus prepared by puncturing, it may be employed for tranſmitting the ſketch to any number of grounds.

The manner of uſing ſoap, for taking off the impreſſion of a print on a new ground, is this: Smear the original over with the common ſoft ſoap, commixed with water till it be of the conſiſtence of a thin jelly, and then lay it even on the ground intended to receive the impreſſion, which muſt be alſo previouſly moiſtened with water. After which, being covered with ſeveral other papers, the whole muſt be compreſſed, by paſſing a wooden roller over them, or by rubbing ſtrongly on them with the calender glaſs uſed for glazing linen, or by any parallel means. The impreſſion of the original will by this means be imparted to the new ground; which muſt be firſt dried, and then carefully waſhed with a ſpunge and water to take off the ſoap. It has been ſaid by ſome, that this treatment will do very little injury to the original print; but, beſides the impracticability of ever thoroughly cleanſing it from the ſoap, a part of the printing ink is taken from it, and a proportionable ſhare of the effect of the original impreſſion deſtroyed.

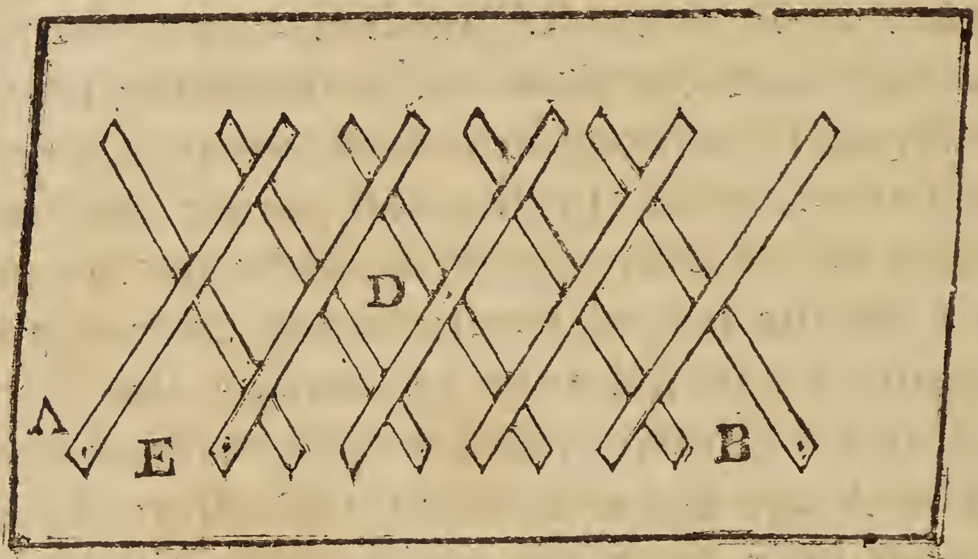
A method parallel to this is ſometimes uſed with prints and drawings: which is, by holding them up to the light, and tracing the proper outlines on the back with a black lead pencil, or any kind of crayon, and then laying the traced ſide on a ground proper to receive the impreſſion, going over them with a roller or calender glaſs, in the ſame manner as when the impreſſion is taken by means of ſoap. On the ſame principle, in the caſe of copartments, cyphers, or any other regular figures, where both ſides are alike, when one half is drawn or traced, the other half may be procured by doubling the paper exactly in the place where the two halves ſhould join, and then preſſing or rolling over the outſide of the ſketched part; by which treatment a correſpondent impreſſion of the deſign will be made on the other ſide, and the whole ſketch will be finiſhed without the trouble of drawing or tracing out the ſecond half.

The method of copying deſigns by the uſe of the ſquares, either in order to paint in equal magnitude, or with a view to reduction, is thus: Divide the original into a convenient number of ſquares, by ruling lines acroſs it with any kind of crayon and then do the ſame on the ground, in a correſpondent manner. The ſquares on the new ground may be either increaſed, diminiſhed, or made equal as to their ſize, with reſpect to thoſe of the original, according to the intended proportion of the new piece. The principal uſe of the ſquares, in this caſe, is ſo much the ſame as when they are applied to the taking drawings from nature, that it is needleſs to dwell longer on them now. I ſhall only intimate, that, to thoſe who can draw at all, the uſe of the ſquares is much more adviſeable here, as well as in drawing after nature, than any of the other methods; as it is much more improving, and on the whole leſs troubleſome, to make a correct ſketch this way than by any other.

The manner of reduction, or, if that be not neceſſary, of tracing out an outline, where the magnitude of the original is to be preſerved, by the machine above-mentioned, which was formerly called a *parallelogram*, and by ſome at preſent a *mathematical compaſs*, cannot be ſhewn without firſt deſcribing fully, or exhibiting by a figure, the conſtruction of the inſtrument. I ſhall therefore endeavour to explain the ſtructure and manner of fabrication of it, as well as thoſe of a machine ſomewhat complex admit; and what may eſcape the conception in the verbal deſcription, may be ſupplied by the inſpection of the figure annexed.

This inſtrument is compoſed of a board, or table, with ten pieces of wood fixed upon it, in a moveable manner; and by ſuch a conſtruction, that when one is moved, the whole of the reſt move alſo ſimilarly, with reſpect to the directions, but under greater or leſs angles. The board or table may be of fir deal, and is uſually made in the form of a parallelogram. The magnitude of it, as well as of the other parts of the machine, muſt be according to that of the pictures, &c. it is intended to be uſed for reducing. But for the ſake of giving the comparative proportions, we will ſtate it at three feet in length, and the breadth may be about a foot and a half. It muſt be plained very even, but ſhould not be of too thin ſubſtance, leſt it warp, and it muſt be covered with cloth ſtretched even upon it, and faſtened down to it. The ten pieces of wood muſt be formed like rulers uſed for writing, and, in the proportion here taken, they may be a foot long, and about half an inch in breadth, and the fifth or ſixth of an inch in thickneſs. They muſt be faſtened to each other in ſuch manner, that every one muſt be croſſed by another in the centre, and by two others at ſuch diſtance from the centre as exactly divides the two half lengths on each ſide of it; except the two which form the extremities, and can be only croſſed in the centre and in the middle of one part, which, in each extremity, will be the part oppoſite to that ſo croſſed in the other, as will immediately appear on the pieces being laid together in the poſition here directed. The faſtening muſt be by pins, or rivets, on which each piece may be turned with perfect freedom; and near each end of every piece muſt be made a hole or a female ſcrew, into which a crayon, port-crayon, or pencil may be fixed, either by or without a ſcrew. At the ends of thoſe pieces which make the extremities, there muſt be a ſmaller hole for a pin to be paſſed through to faſten the conjoined pieces to the board. In order to the more commodiouſly fixing the ſeveral parts of the inſtrument to the board or table, it may be proper to have female ſcrews at the places of the table where the rulers are to be pinned down, according to the different applications of the inſtrument; and the pins for faſtening the reſpective parts muſt in this caſe have male ſcrews at their extremities, correſpondent to the female ſcrews in the table. By theſe directions cloſely followed, the parts of the inſtrument may be completely formed and put together; but to explain the manner of uſing it, the figure is here given, as it is more eaſy to refer to the parts of that, than to ſuch as have only a verbal ſpecification.

Let the leg or extremity of the piece *A* be faſtened to the board in the part of it as here



delineated, and let the picture, &c. be placed under the end of the piece *B*, a ſtrong pin blunted, or other ſuch rigid body being put through the end of it, and placed in the centre of the picture, or any other part where it may be convenient to begin the tracing. Let the ground intended to receive the drawing, or ſketch, be then placed at *E*, the next leg to that faſtened to the board, if the deſign of the original be intended to be diminiſhed in the utmoſt degree the machine can effect, or to any of the other legs nearer to the original, according to the proportion of the diminution required. A crayon, or pencil muſt then be fixed in the hole of the piece *E*, made for that purpoſe, and muſt reſt on the ground of the ſketch, which ground muſt be ſo placed, that the crayon or pencil may be immediately over the part of it which correſponds with the part of the original touched by the blunted pin. The picture and ground of the ſketch muſt then be faſtened firmly to the board, and the artiſt bearing with his left hand gently on the crayon or pencil over the ground, muſt trace, with the blunted pin or ſtift fixed in the hole of the moſt diſtant leg, the outlines of the original, which will ſo move the crayon or pencil on the ground for the ſketch that a correſpondent line will be marked there, but with the diminution of the deſign in the proportion deſired.

When the enlargement of the original is deſired, the reverſe muſt be practiſed with regard to the ſituation of the original and copy; for if the original be placed under *E*, the piece next to that faſtened to the board, and the new ground be put under *B*, the end of the leg where the original was before placed, the ſubſequent management being the ſame as before in all other reſpects, the ſketch will be augmented in an equal degree to what it was diminiſhed before.

If a ſketch of equal magnitude be deſired, the faſtening of the conjoined pieces to the table or board muſt be at *D*, in the centre of the whole, and the original and new ground placed under the pieces at each extremity, or any other correſpondent pieces that may be moſt commodious.

This machine may be uſed for off-tracing maps, or other ſuch ſimpler deſigns, or may afford amuſement by off-tracing pictures, &c. to thoſe who have no facility in drawing. But to the abler and more expert in theſe arts, where deſigns that demand ſpirit and pencil are in queſtion, it ſeems an expedient below their regard, as performing by an imperfect mechanical aid what they can execute better by their own natural powers.

CHAP. II.

Of the means of taking caſts and impreſſions from figures, buſts, medals, leaves, &c.

THE method of taking caſts of figures and buſts, as at preſent practiſed, is moſt generally by the uſe of plaiſter of Paris; or, in other words, alabaſter calcined by a gentle heat. The advantage of uſing this ſubſtance preferable to others, conſiſts in this, that notwithſtanding a ſlight calcination reduces it to a pulverine ſtate, it becomes again a tenacious and cohering body by being moiſtened with water, and afterwards ſuffered to dry. By this means either a concave or convex figure may be given by a proper mold or model to it when wet, and retained by the

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hardneſs it acquires when dry, and from theſe qualities it is fitted to the double uſe of making both caſts and molds for forming thoſe caſts. The plaiſter is to be had ready prepared of thoſe who make it their buſineſs to ſell it, and the only care is to ſee that it is genuine.

The particular manner of making caſts depends on the form of the ſubject to be taken. Where there are no projecting parts, it is very ſimple and eaſy, as likewiſe where there are ſuch as form only a right or any greater angle with the principal ſurface of the body. But where parts project in leſſer angles, or form curves inclined towards the principal ſurface of the body, the work is more difficult. I ſhall therefore firſt explain thoſe particulars of the manner which are general to all kinds, and then point out the extraordinary methods to be uſed where difficulties occur.

The firſt ſtep to be taken is the forming the mold, which is, indeed, done by much the ſame means, as the caſt is afterwards made in it In order to this, if the original or model be a baſs-relief, or any other piece of a flat form, having its ſurface firſt well greaſed, it muſt be placed on a proper table, or other ſuch ſupport, and ſurrounded by a frame, the ſides of which muſt be at ſuch a diſtance from it as will allow a proper thickneſs for the ſides of the mold. A due quantity of the plaiſter, that is, what will be ſufficient to cover and riſe to ſuch a thickneſs as may give ſufficient ſtrength to the mold, as alſo to fill the hollow betwixt the frame and the model, muſt be moiſtened with water, till it be juſt of ſuch conſiſtence as will allow it to be poured upon the model. The plaiſter, thus moiſtened, muſt be then put on the model as ſoon as poſſible; for it muſt not be delayed after the water is added to the plaiſter, which would otherwiſe concrete or ſet, ſo as to become more troubleſome in the working, or unfit to be uſed. The whole muſt then be ſuffered to remain in this condition till the plaiſter has attained its hardneſs, and then the frame being taken away, the preparatory caſt or mold, thus formed, may be taken off from the ſubject intire.

Where the model or original ſubject is of a round or erect form, a different method muſt be purſued, and the mold muſt be divided into ſeveral pieces; or, if the ſubject conſiſts of detached and projecting parts, it is frequently moſt expedient to caſt ſuch parts ſeparately, and afterwards join them together.

Where the original ſubject or model forms a round, or ſpheroid, or any part of ſuch round, or ſpheroid, more than one half the plaiſter muſt be uſed without any frame to keep it round the model, and muſt be tempered with water to ſuch a conſiſtence, that it may be wrought with the hand like very ſoft paſte. But though it muſt not be ſo fluid as when prepared for flat-figured models, it muſt yet be as moiſt as if compatible with its cohering ſufficiently to hold together. Being thus prepared, it muſt be put upon the model, and compreſſed with the hand, or any flat inſtrument, that the parts of it may adapt themſelves in the moſt perfect manner to thoſe of the ſubject, as well as be compact with reſpect to themſelves. When the model is ſo covered to a convenient thickneſs, the whole muſt be left at reſt till the plaiſter be ſet and firm, ſo as to bear dividing without falling to pieces, or being liable to be put out of its form by ſlight violence. It muſt then be divided into pieces, in order to its being taken off from the model, by cutting it with a knife, or with a very thin blade; and, being divided, muſt be cautiouſly taken off, and kept till dry. But it muſt be always carefully obſerved, before the ſeparation of the parts be made, to notch them croſs the joints, or lines of the diviſion, at proper diſtances, that they may with eaſe and certainty be properly conjoined again, which would be much more precarious and troubleſome without ſuch directive marks. The art of properly dividing the molds, in order to make them ſeparate from the model, conſtitutes the greateſt object of dexterity and ſkill in the art of caſting, and does not admit of rules for the moſt advantageous conduct of it in every caſe. But I ſhall endeavour to explain the principles on which it depends in ſuch manner that by a due application of them all difficulties may at any time be ſurmounted, and an expertneſs even of manner acquired by a little practice. With reſpect to the caſe in queſtion, where the ſubject is of a round or ſpheroidal form, it is beſt to divide the mold into three parts, which will then eaſily come off from the model, and the ſame holds good of a cylinder, or any regular curve figure.

The mold being thus formed and dry, and the parts put together, it muſt be firſt greaſed and placed in ſuch a poſition, that the hollow may lie upwards, and then filled with plaiſter commixed with water, in the ſame proportion and manner as was directed for the caſting the mold; and when the caſt is perfectly ſet and dry, it muſt be taken out of the mold and repaired where it is neceſſary, which finiſhes the whole operation.

This is all that is required with reſpect to ſubjects where the ſurfaces have the regularity above-mentioned; but where they form curves which interſect each other, the conduct of the operation muſt be varied with reſpect to the manner of taking the caſt of the mold from off the ſubject or model; and where there are long projecting parts, ſuch as legs or arms, they ſhould, as was obſerved before, be wrought in ſeparate caſts.

The method of dividing properly the molds cannot be reduced, as I intimated, to any particular rules, but muſt depend in ſome degree on the ſkill of the operator, who may eaſily judge from the original ſubjects, by the means here ſuggeſted, what parts will come off together, and what require to be ſeparated. The principle of the whole conſiſts only in this, that where *under-workings*, as they are called, occur, that is, wherever a ſtraight line drawn from the baſis or inſertion of any projection, would be cut or croſſed by any part of ſuch projection, ſuch part cannot be taken off without a diviſion. This muſt be made either in the place where the projection would croſs the ſtraight line; or, as that is frequently difficult, the whole projection muſt be ſeparated from the main body, and divided alſo lengthways into two parts. Where there are no projections from the principal ſurfaces, but the body is ſo formed as to render the ſurface a compoſition of ſuch curves, that a ſtraight line being drawn parallel to the ſurface of one part would be cut by the outline; in one or more places of another part, a diviſion of the whole ſhould be made, ſo as to reduce the parts of it into regular curves, which muſt then be treated as ſuch.

Where detached parts of a long form, as legs, arms, ſpears, ſwords, &c. occur in any figure, they ſhould be caſt in ſeparate molds, and if ſuch parts are of a compound ſtructure, the ſame rules as were before intimated muſt be obſerved in the management of them, as are already directed for the principal part.

In larger maſſes, where there would otherwiſe be a great thickneſs of the plaiſter, a corps or body may be put within the mold, in order to produce a hollow in the caſt, which both ſaves the expence of the plaiſter, and renders the caſt lighter.

This corps may be of wood, where the forming a hollow of a ſtraight figure, or ſuch as is conical with the baſis outward, will anſwer the end. But if the cavity require to be round, or of any curve figure, the corps cannot be then drawn while intire, and conſequently ſhould be of ſuch matter as will ſuffer itſelf to be taken out piece-meal. In this caſe, therefore, the corps is beſt formed of clay, which muſt be worked upon wires to give it tenacity, and ſuſpended in the hollow of the mold, by croſs-wires lying over the mouth; and when the plaiſter is ſufficiently ſet to bear handling, the clay muſt be picked out by a proper inſtrument.

Where it is deſired to render the plaiſter harder, the water with which it is tempered ſhould be mixed with parchment-ſize prepared as below directed, which will make it very firm and tenacious.

In the ſame manner, figures, buſts, &c. may be caſt of lead, or any other metal, in the molds of plaiſter, only the expence of plaiſter, and the tedioufneſs of its becoming ſufficiently dry, when in a very large maſs, to bear the heat of melted metal, render the uſe of clay, compounded with ſome other proper materials, preferable, where large ſubjects are in queſtion. The clay, in this caſe, ſhould be waſhed over till it be perfectly free from gravel or ſtones, and then mixed with a third or more of fine ſand to prevent its cracking; or, inſtead of ſand, coal aſhes, ſifted till they be perfectly fine, are preferable. Whether plaiſter or clay be uſed for the caſting in metal, it is extremely neceſſary to have the mold perfectly dry, otherwiſe the moiſture, being rarified, will make an exploſion that will blow the metal out of the mold, and endanger the operator, or at leaſt crack the mold in ſuch manner as to fruſtrate the operation. Where the parts of a mold are larger, or project much, and conſequently require a greater tenacity of coheſion of the matter they are formed of to keep them together, flocks of cloth, prepared like thoſe deſigned for the paper hangings, or fine cotton plucked or cut till it is very ſhort, ſhould be mixed with the aſhes or ſand before they be added to the clay to make the compoſition for the mold. The proportion ſhould be according to the degree of coheſion required; but a ſmall quantity will anſwer the end, if the other ingredients of the compoſition be good, and the parts of the mold properly linked together by means of the wires above directed.

There is a method of taking caſts in metals from ſmall animals, and the parts of vegetables,

tables, which, though not much known or uſed in this country, may be nevertheleſs practiſed for ſome purpoſes with advantage, particularly for the decorating grottos or rock-work, where nature is imitated. The proper kinds of animals are lizards, ſnakes, frogs, birds, or inſects; the caſt of which being properly coloured will be exact repreſentations of the originals.

This is to be performed by the following method. A coffin or proper cheſt for forming the mold being prepared of clay, or four pieces of boards fixed together, the animal, or parts of vegetables, muſt be ſuſpended in it by a ſtring, and the leaves, tendrils, or other detached parts of the vegetables, or the legs, wings, &c. of the animals, properly ſeparated and adjuſted in their right poſition by a ſmall pair of pincers. A due quantity of plaiſter of Paris, and calcined talc, in equal quantities, with ſome *alumen plumoſum*, muſt then be tempered with water to the proper conſiſtence for caſting, and the ſubject from whence the caſt is to be taken, as alſo the ſides of the coffin moiſtened with ſpirit of wine.

The coffin or cheſt muſt be then filled with the tempered compoſition of the plaiſter and talc; but, at the ſame time, a piece of ſtraight ſtick or wood muſt be put to the principal part of the body of the ſubject, and pieces of thick wire to the extremities of the other parts, in order that they may form, when drawn out after the matter of the mold is properly ſet and firm, a channel for pouring in the melted metal, and vents for the air, which otherwiſe, by the rarefaction it would undergo from the heat of the metal, would blow it out, or burſt the mold. In a ſhort time the plaiſter and talc will ſet and become hard, when the ſtick and wires may be drawn out, and the frame or coffin in which the mold was caſt taken away. The mold muſt then be put firſt into a moderate heat, and afterwards, when it is as dry as it can be rendered by that degree, removed into a greater, which may be gradually increaſed till the whole be red-hot. The animal, or part of any vegetable, which was included in the mold, will then be burnt to a coal, and may be totally calcined to aſhes, by blowing for ſome time gently into the channel and paſſages made for pouring in the metal, and giving vent to the air, which will, at the ſame time that it incinerates the remainder of the animal or vegetable matter, blow out the aſhes. The mold muſt then be ſuffered to cool gently, and will be perfect, the deſtruction of the ſubſtance of the animal, or vegetable, having produced a hollow of a figure correſpondent to it; but it may be nevertheleſs proper to ſhake the mold, and turn it upſide down, as alſo to blow with the bellows into each of the air vents, in order to free it wholly from any remainder of the aſhes; or, where there may be an opportunity of filling the hollow with quickſilver without expence, it will be found a very effectual method of clearing the cavity, as all duſt, aſhes, or ſmall detached bodies, will neceſſarily riſe to the ſurface of the quickſilver, and be poured out with it. The mold being thus prepared, it muſt be heated very hot when uſed, if the caſt be made with copper or braſs; but a leſs degree will ſerve for lead or tin. The melted metal muſt be then poured in, the mold gently ſtruck, and ſuffered to reſt till it be cold. At which time it muſt be carefully taken from the caſk, but without the leaſt force; for ſuch parts of the matter as appear to adhere more ſtrongly, muſt be ſoftened by ſoaking in water till they be intirely looſened, that none of the more delicate parts of the caſt may be broken off or bent.

Where the *alumen pulmoſum*, or talc, cannot be eaſily procured, the plaiſter may be uſed alone; but it is apt to be calcined by the heat uſed in burning the animal or vegetable from whence the caſt is taken, and to become of too incohering and crumbly a texture. For cheapneſs, Sturbridge clay, or any other potter's or other good clay, waſhed over till it be perfectly fine, and mixed with an equal part of ſand and ſome flocks cut ſmall, may be employed. Pounded pumice-ſtone and plaiſter of Paris, taken in equal quantities, and mixed with waſhed clay in the ſame proportion, is ſaid to make excellent molds for this and parallel uſes.

Caſts of medals, or ſuch ſmall pieces as are of a ſimilar form, may be made in plaiſter by the method directed for baſs relieves. Indeed there is nothing more required than to form a mold, by laying them on a proper board; and, having ſurrounded them by a rim made of a piece of a card or any other paſteboard, to fill the rim with ſoft tempered plaiſter of Paris, which mold, when dry, will ſerve for ſeveral caſts. It is nevertheleſs a better method to form the mold of melted ſulphur, which will produce a ſharper impreſſion in the caſt, and be more durable than thoſe made of plaiſter.

The caſts of medals are likewiſe frequently made of ſulphur, which being melted, muſt be treated exactly in the ſame manner as the plaiſter.

Caſts may be made likewiſe with iron, with very little additional trouble, provided it be prepared in the following manner.

"Take any iron bar, or piece of a ſimilar "form, and, having heated it red-hot, hold "it over a veſſel containing water, and touch "it very ſlightly with a roll of ſulphur, which "will immediately diſſolve it, and make it "fall in drops into the water under it. As "much iron as may be wanted being thus "diſſolved, pour the water then out of the "veſſel, and pick out the drops formed by "the melted iron from thoſe of the ſulphur, "which contain little or no iron, and will be "diſtinguiſhable from the other by their co"lour and weight."

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The iron will, by this means, be rendered ſo fuſible, or eaſy to be melted, that it will run with leſs heat than will melt lead, and may be employed for making caſts of medals, and many other ſuch purpoſes, with great convenience and advantage.

Impreſſions of medals, having the ſame effect as caſts, may be made alſo of iſinglaſs glue by the following means. Melt the iſinglaſs, beaten as when commonly uſed, in an earthen pipkin, with the addition of as much water as will cover it, ſtirring it gently till the whole be diſſolved; then, with a bruſh of camel's hair, cover the medal, which ſhould be previouſly well cleanſed and warmed, and then laid horizontal on a board or table greaſed in the part around the medal. Let them reſt afterwards till the glue be properly hardened, and then with a pin raiſe the edge of it, and ſeparate it carefully from the medal; the caſt will be thus formed by the glue as hard as horn, and ſo light that a thouſand will ſcarcely weigh an ounce. In order to render the relief of the medal more apparent, a ſmall quantity of carmine may be mixed with the melted iſinglaſs, or the medal may be previouſly coated with leaf gold by breathing on it, and then laying it on the leaf, which will by that means adhere to it; but the uſe of the leaf gold is apt to impair a little the ſharpneſs of the impreſſion.

There is likewiſe a method of making impreſſions of the ſame kind in lead, which is

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this. Lay the medal on a poſt, or other firm body of wood, and cover it with a piece of very thin plate of lead, and lay over that another piece of thicker plate. Then place on them end-ways a piece of wood turned of a round figure, which may be a foot or more in length, and of ſuch thickneſs, that its diameter may be ſomewhat greater than that of the medal. Strike then forcibly on the upper end of the wood with a mallet, or ſome ſuch inſtrument, and the undermoſt plate of lead will receive the impreſſion of the medal; to preſerve which, the concave of the reverſe may be filled up with reſin, mixed with an equal part of brick-duſt, and melted. The impreſſion ſhould be made with one ſtroke, which will produce a ſufficient effect, if given with due ſtrength, and in a perpendicular direction. Impreſſions may be even taken from ſealing-wax or ſulphur in this manner, if the pieces be no way concave or bending on their under ſide.

Impreſſions of medals may be likewiſe taken in putty, but it ſhould be the true kind made of earth of tin and drying oil. Theſe may be formed in the molds previouſly taken in plaiſter or ſulphur, or molds may be made in its own ſubſtance in the manner directed for thoſe of the plaiſter. Theſe impreſſions will be very ſharp and hard, but the greateſt diſadvantage that attends them is their drying very ſlowly, and being liable in the mean-time to be damaged.

Impreſſions of prints, or other engravings, may be taken from copper-plates by cleaning them thoroughly, and pouring plaiſter upon them; but the effect in this way is not ſtrong enough for the eye, and therefore the following method is preferable where ſuch impreſſions on plaiſter are deſired.

Take vermilion, or any other coloured pigment finely powdered, and rub it over the plate; then paſs a folded piece of paper, or the flat part of the hand over the plate, to take off the colour from the lights or parts where there is no engraving. The proceeding muſt then be the ſame as where no colour is uſed. This laſt method is alſo applicable to the making impreſſions of copper-plates on paper with dry colours; for the plate being prepared as here directed, and laid on the paper properly moiſtened, and either paſſed under the rolling-preſs, or any other way ſtrongly forced down on the paper, an impreſſion of the engraving will be obtained.

Impreſſions may be likewiſe taken from copper-plates, either on plaiſter or paper, by means of the ſmoke of a candle or lamp; if, inſtead of rubbing them with any colour, the plate be held over the candle or lamp, till the whole ſurface become black, and then wiped off by the flat of the hand or paper.

Theſe methods are not, however, of very great uſe in the caſe of copper-plates, except where impreſſions may be deſired on occaſions where printing ink cannot be procured; but as they may be applied likewiſe to the taking impreſſions from ſnuff-boxes, or other engraved ſubjects, by which means deſigns may be inſtantly borrowed by artiſts or curious perſons, and preſerved for any uſe, they may in ſuch inſtances be very uſeful.

The expedient of taking impreſſions by the ſmoke of a candle or lamp may be employed alſo for botanical purpoſes, in the caſe of leaves; as a perfect and durable repreſentation of not only the general figure, but the contexture and diſpoſition of the larger fibres, may be extemporaneouſly obtained at any time. The ſame may be, nevertheleſs, done in a more perfect manner by the uſe of linſeed oil, either alone, or mixed with a ſmall proportion of colour, where the oil can be conveniently procured. But the other method is valuable, on account of its being practicable at almoſt all ſeaſons, and in all places, within the time that the leaves will keep freſh and plump. In taking theſe impreſſions, it is proper to bruiſe the leaves, ſo as to take off the projections of the large ribs, which might prevent the other parts from plying to the paper.

Leaves, or alſo the petals, or flower leaves of plants, may themſelves be preſerved on paper, with their original appearance, for a conſiderable length of time, by the following means. Take a piece of paper, and rub it over with the iſinglaſs glue, treated as above directed for taking impreſſions from medals; and then lay the leaves in a proper poſition on the paper. The glue laid on the paper being ſet, bruſh over the leaves with more of the ſame, and that being dry likewiſe, the operation will be finiſhed, and the leaves ſo ſecured from the air and moiſture, that they will retain their figure and colour much longer than by any other treatment.

Butterflies, or other ſmall animals of a flat figure, may alſo be preſerved in the ſame manner.

PART III.

Of gilding, ſilvering, bronzing, japanning, lacquering, and the ſtaining different kinds of ſubſtances, with all the variety of colours.

CHAP. I.

Of gilding.

SECT. I. *Of gilding in general.*

THE gilding different ſubſtances is performed by a variety of means accommodated to the nature of each; but the principle is the ſame in all, (except with reſpect to one kind practiſed on metals, where quickſilver and heat is uſed, which I omit here as not properly a part of the ſubject of this work) being only the putting ſome proper cement on the body to be gilt, and then laying the gold either in the form of leaves or powder on the cement, which binds it to the body.

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The principal kinds of gilding are thoſe called *oil gilding*—*burniſh gilding*—and *japanner's gilding*, or *gilding with gold ſize.* Theſe may be promiſcuouſly uſed on grounds either of wood, metal, or any other firm and rigid body; but paper and leather require a treatment, in ſome caſes, peculiar to themſelves.

The firſt attention in moſt kinds of gilding is the choice of leaf gold, which ſhould be pure, and of the colour accommodated to the purpoſe, or taſte of the work. Purity is requiſite in all caſes; for if the gold be allayed with ſilver it will be of too pale and greeniſh a hue for any application, and if it contain much copper, it will in time turn to a yet much ſtronger green. The purity may be aſcertained with accuracy enough for this purpoſe by the touchſtone and *aqua fortis*, and the fitneſs of the colour to any particular purpoſe may be diſtinguiſhed by the eye. The full yellow is certainly the moſt beautiful and trueſt colour of gold; but the deep reddiſh caſt has been of late moſt eſteemed from the caprice of faſhion. Whichever may be choſen, the colour ought nevertheleſs to be good of the kind; for there is a great variation in the force and effect of different parcels of the ſame teint, ſome appearing more foul and muddy, others bright and clear.

The beſt method, however, of judging of the colour of leaf gold with nicety, is by keeping a ſpecimen of ſuch as is perfect, with which any freſh parcel may be occaſionally compared.

There is, beſides the true leaf gold, another kind in uſe, called Dutch gold, which is copper gilt, and beaten into leaves like the genuine. It is much cheaper, and has, when good, greatly the effect of the true at the time of its being laid on the ground; but, with any acceſs of moiſture, it loſes it colour and turns green in ſpots, and, indeed, in all caſes its beauty is ſoon impaired, unleſs well ſecured by lacquer or varniſh. It is nevertheleſs ſerviceable for coarſer gilding where large maſſes are wanted, eſpecially where it is to be ſeen by artificial light, as in the caſe of theatres, and, if well varniſhed, will there in a great meaſure anſwer the end of the genuine kinds.

The other preparations of gold belonging to particular kinds of gilding, I ſhall treat of them, as likewiſe the cements or other ſubſtances employed, in their reſpective places, and proceed now to ſhew what the inſtruments are which are common to the three principal methods.

SECT. II.

Of the inſtruments that are common to the oil, burniſh, and japanner's gilding.

THE firſt neceſſary inſtrument is a cuſhion for receiving the leaves of gold from the paper, in order to its being cut into proper ſize and figures for covering the places to be gilt. This cuſhion ſhould be made of leather, and faſtened to a ſquare board, which ſhould have a handle. It may be of any ſize, from fourteen inches ſquare to ten, and ſhould be ſtuffed betwixt the leather and board with fine tow or wool, but in ſuch a manner that the ſurface may be perfectly flat and even.

A proper knife is the next, and an equally requiſite inſtrument, as it is neceſſary in all caſes to cut or divide the gold into parts correſpondent to thoſe which are to be covered. This knife may be the ſame in all reſpects as thoſe uſed in painting, called *palette knives*, the blade of which may be four or ſix inches long, and ſomewhat more than half an inch in breadth, with a handle proportionable.

A ſquirrel's tail is likewiſe generally provided for taking up the whole leaves, and for compreſſing the gold to the ſurface where it is laid, and giving it the poſition required. It is uſed alſo by ſome for taking up the parts of leaves; but this is better done by means of a ball of cotton wool, which will both anſwer this end, and that of compreſſing the gold in a more eaſy and effectual manner. This ſquirrel's tail is cut ſhort, and ſometimes ſpread in a fan-faſhion by means of a piece of wood formed like a pencil ſtick, but broad at one end, and ſplit to receive the tail; but it will equally ſerve the purpoſe of its own form, when the hair is cut to a proper length. This inſtrument is by ſome called a *palette*, but improperly, as the board for holding the colours in painting, and which is frequently in uſe along with this, being called by the ſame name, would neceſſarily produce a confuſion in ſpeaking of either.

A bruſh of very ſoft hog's hair, or of the fitch kind, made large, is likewiſe commonly uſed for paſſing over the work when it is become dry, in order to take off the looſe gold.

Some fine cotton wool is alſo neceſſary for taking up the ſmaller parts of the leaves, and laying them on the work, as alſo for compreſſing and adjuſting them when laid on. The cotton ſhould be formed into a ball by tying it up in a piece of fine linen rag; for, if it be uſed without the rag, the fibres adhere to the gold ſize, and embarraſs the work.

A ſmall ſtone and mullar, with a proportionable palette knife, are required for grinding and tempering the mixtures made of the fat oil, or gold ſize, with each other, and the colours that may be added to them. Proper bruſhes are alſo wanted for laying on and ſpreading the fat oil, or ſize, on the work, and ſome of theſe ſhould be fitches of different ſizes, in order to convey and ſettle the gold where the relief of carved work forms deep hollows.

Theſe are all the inſtruments that are common to all the three principal kinds of gilding; ſuch as are peculiar to each, I ſhall take notice of where they more properly occur.

SECT. III.

Of the manner of oil gilding, and the preparation of fat oil.

THE gilding with oil is the moſt eaſy and cheap, as well as moſt durable kind, and, therefore, is moſtly applied to common purpoſes. It is performed by cementing the gold to the ground by means of fat oil. The preparation of which is, therefore, previouſly neceſſary to be known, and may be much better managed in the following manner than by any method hitherto taught, or commonly practiſed.

“ Take any quantity of linſeed oil, and
“ put it into an earthen, or any other veſſel of
“ a broad form, ſo that the oil may lie in it
“ with a very large ſurface; but the propor-
“ tion

"tion ſhould be ſo limited that the oil may be "about an inch thick in the veſſel. The "earthen pans uſed for milk in the forming "cream for butter are very well accommo"dated to this purpoſe. Along with the oil "as much water ſhould be alſo put into the "veſſel as will riſe ſix inches or more above "the bottom. Place the veſſel then, with the "oil ſwimming on the water, in any open "place where the ſun and rain may have acceſs "to it, but where it may be as free from "receiving duſt and filth as poſſible. Let it "ſtand in this condition, ſtirring the contents "on every opportunity, for five or ſix weeks, "or till it appear of the conſiſtence of treacle. "Take the oil then from off the water into "a phial, or bottle of a long form, or, what "is better, into a ſeparating funnel, ſuch as "is uſed by the chymiſts, and there draw off "the remainder of the water. Place it after"wards, being in the long bottle or phial, in "ſuch heat as will render it perfectly fluid, "and the foulneſſes it may contain will ſoon "ſubſide to the bottom, when the clear part "muſt be poured off, and the remainder "ſtrained through a flannel, while yet water, "and the whole will then be fit for uſe."

It is to be obſerved, that this method is only practicable in ſummer, as the ſun has not ſufficient power in winter to produce a due change in the oil.

This method differs from that commonly practiſed in the addition of the water, which ſuffers the foulneſs to ſeparate from the oil and ſink to the bottom, where it remains without being again mixed with the oil every time it is ſtirred, as is unavoidable where no water is uſed. The water likewiſe greatly contributes to bleach the oil, and improve it in other reſpects.

The beſt previous preparation of the piece to be gilded, if it have not already any coat of oil paint, is to prime it with drying oil mixed with a little yellow ochre, to which alſo a very ſmall proportion of vermilion may be added. But where greater nicety and perfection is required in the work, the wood ſhould be firſt rubbed with fiſh-ſkin, and then with Dutch ruſhes.

This priming being dry, the next part of the operation is the ſizing the work, which may be done either with the fat oil alone, (but diluted with drying oil, if too thick to be worked without) or with fat oil and the japanner's gold ſize, (of which the preparation is below taught) either in equal quantities, or in any leſs proportion, with reſpect to the gold ſize. The difference betwixt the uſe and omiſſion of the gold ſize, in this way of gilding, lies in two particulars. The one is, that the ſizing dries faſter according to the proportion of the quantity of the gold ſize to the fat oil, and is conſequently ſo much the ſooner fit to be gilded. The other is, that the gilding is alſo rendered, in the ſame proportion, leſs ſhining and gloſſy, which is eſteemed a perfection in this kind of gilding; though, taking away the prejudice of faſhion, I ſhall think the moſt ſhining the moſt beautiful, and of the ſtrongeſt effect.

The fat oil, or the compound of that and the gold ſize, muſt be ground with ſome yellow ochre, and then, by means of a bruſh, laid thinly over the work to be gilt. But, in doing this, care muſt be taken to paſs the bruſh into all the hollows and cavities, if the ſubject be carved, or have any other way projecting parts. For where the ſize fails to be laid on, the gold will never take till the work be again repaired by going over the defective places with freſh ſize, which ſhould be avoided as much as poſſible. Where great perfection is required, the gold ſhould not be laid on the firſt ſizing; but that being ſuffered to dry, the work ſhould be again ſized a ſecond time, and ſome who are very nice even proceed to a third.

The work being thus ſized, muſt be kept till it appear in a proper condition to receive the gold, which muſt be diſtinguiſhed by touching with the finger. If it appear then a little adheſive or clammy, but not ſo as to be brought off by the finger, it is in a fit condition to be gilt. But if it be ſo clammy as to daub or come off on being touched, it is not ſufficiently dry, and muſt be kept longer; or, if there be no clammineſs or ſticky quality remaining, it is too dry, and muſt be ſized over again before it can be gilt.

When the work is thus ready to receive the gold, the leaves of gold, where the ſurface is ſufficiently large and plain to contain them, may be laid on entire, either by means of the ſquirrel's tail, or immediately from the paper in which they were originally put; a method that, by thoſe who have the proper dexterity of doing it, is found to be much the ſimpleſt and quickeſt, as well as beſt, for the perfection of the work. Being laid on the proper parts of the work, the leaves muſt then be ſettled to the ground, by compreſſing thoſe which appear to want it gently with the ſquirrel's tail or cotton ball; and if any part of the gold has flown off, or been diſplaced, ſo as to leave a naked or uncovered ſpot, a piece of another leaf, of ſize and figure correſpondent to ſuch ſpot, muſt be laid upon it. Where the parts are too ſmall to admit of the laying on whole leaves, or where vacancies are left after laying on whole leaves which are leſs than require others to cover them, the leaves which are to be uſed muſt be firſt turned from the paper upon the cuſhion, deſcribed above amongſt the inſtruments. They muſt then be cut, by ſcoring over them, with the knife, (above deſcribed likewiſe) into ſuch diviſions or ſlips as may be moſt commodiouſly laid on the parts of the work to be covered; after which, being ſeparated, and taken up as they are wanted, by means of the cotton wool, to which being breathed upon they will adhere, they muſt be laid in the places they are deſigned to cover, and gently preſſed by the cotton till they touch every where, and lie even on the ground.

Where the work is very hollow, and ſmall pieces are wanted to cover parts that lie deep and out of the reach of the ſquirrel's tail or the cotton, they may be taken up by the point of a fitch pencil, (being firſt breathed upon) and by that means conveyed to, and ſettled in their proper place. Thoſe who are accuſtomed to it uſe the pencil commodiouſly for a great part of the work where large parts of the leaves cannot be uſed.

The whole of the work being thus covered, ſhould be ſuffered to remain till it be dry, and it may then be bruſhed over by a camel's hair pencil, or ſoft hog's hair bruſh, to take off from it all looſe parts of the gold.

If, after the bruſhing, any defective parts or vacancies appear in the gilding, ſuch parts muſt be again ſized, and treated in the ſame manner as the whole was before; but the japanners' gold ſize alone is much better for this purpoſe than either the fat oil alone, or any mixture.

SECT. IV.

Of burniſh gilding, with the preparation of the proper ſizes, &c.

THE gilding with burniſhed gold is ſeldom practiſed but upon wood, and at preſent moſtly in the caſe of carved work, or where carved work is mixed with plain. The chief difference in the manner betwixt this and oil gilding lies in the preparing the work to receive the gold, and in the ſubſtituting a ſize made of parchment, or the cuttings of glover's leather in the place of the fat oil, as a cement. The proportion of the ſize ſhould therefore be previouſly known, and may be as follows.

" Take a pound of cuttings of parchment,
" or of the leather uſed by glovers; and, hav-
" ing added to them ſix quarts of water, boil
" them till the quantity of fluid be reduced to
" two quarts, or till, on the taking out a little,
" it will appear like a jelly on growing cold.
" Strain it through flannel while hot, and it
" will be then fit for uſe."

This ſize is employed in burniſh gilding, not only in forming the gold ſize, or cement for binding the gold to the ground, but alſo in priming, or previouſly preparing the work. But before I proceed to ſhew the manner of uſing it ſo, it is neceſſary to give the compoſitions for the proper cement or gilding ſize employed in this kind of gilding. There are a multiplicity of recipes for this compoſition which are approved of by different perſons, but as in general they vary not eſſentially from each other, I will only give two, which I believe to be each the beſt in their kinds.

" Take any quantity of bole ammoniac, and
" add ſome water to it, that it may ſoak till it
" grow ſoft. Levigate it then on the ſtone,
" but not with more water than will prevent

"its being of a ſtiff conſiſtence, and add to it
"a little purified ſuet or tallow ſcraped, and
"grind them together. When this is wanted
"for uſe, dilute it to the conſiſtence of cream,
"by parchment or glover's ſize mixed with
"double its quantity of water and made
"warm. Some melt the ſuet or tallow, and
"mix it previouſly with five or ſix times its
"weight of chalk before it is put to the bole.
"to facilitate their commixture, to which, in
"this wet ſtate, they are otherwiſe ſomewhat
"repugnant. It is alſo ſometimes practiſed
"to put ſoap-ſuds to the bole, which will con-
"tribute to its uniting with the tallow."

This is the ſimpleſt compoſition, and equally good with the following, or any other; but for the indulgence of the variety of opinions, which reigns in all theſe kinds of matters, I will inſert another.

"Take of bole in fine powder one pound,
"and of black lead two ounces. Mix them
"well by grinding, and then add of olive
"oil two ounces, and of bees-wax one ounce,
"melted together, and repeat the grinding
"till the whole be thoroughly incorporated.
"When this mixture is to be uſed, dilute it
"with the parchment or glover's ſize, as was
"directed in the former recipe. But till the
"time of uſing them, both this and the fore-
"going ſhould be kept immerſed in water,
"which will preſerve them good."

To prepare the wood for burniſh gilding, it ſhould firſt be well rubbed with fiſh-ſkin, and then with Dutch ruſhes; but this can only be practiſed in the larger and plainer parts of the work, otherwiſe it may damage the carving, or render it leſs ſharp by wearing off the points. It muſt then be primed with the glover's ſize, mixed with as much whiting as will give it a tolerable body of colour; which mixture muſt be made by melting the ſize, and ſtrewing the whiting in a powdered ſtate gradually into it, ſtirring them well together, that they may be thoroughly incorporated. Of this priming ſeven or eight coats ſhould be given, time being allowed for the drying of each before the other be put on, and care ſhould be taken in doing this to work the priming well with the bruſh into all the cavities or hollows there may be in the carved work. After the laſt coat is laid on, and before it be quite dry, a bruſh pencil dipped in water, ſhould be paſſed over the whole to ſmooth it and take away any lumps or inequalities that may have been formed, and when it is dry, the parts which admit of it ſhould be again ruſhed over till they be perfectly even. The work ſhould then be repaired, by freeing all the cavities and hollow parts from the priming, which may choak them or injure the relief of the carving; after which, a water poliſh ſhould be given to the parts deſigned to be burniſhed, by rubbing them gently with a fine linen rag moiſtened with water.

The work being thus prepared, when it is to be gilt, dilute the compoſition of bole, &c.

with warm ſize mixed with two-thirds of water, and with a bruſh ſpread it over the whole of the work, and then ſuffer it to dry, and go over it again with the mixture in the ſame manner at leaſt once more. After the laſt coat, rub it in the parts to be burniſhed with a ſoft cloth, till it be perfectly even. Some add a little vermilion to the gilding ſize, and others colour the work, if carved, before it be laid on, with yellow and the glover's ſize, to which a little vermilion, or red lead, ſhould be added. This laſt method is to give the appearance of gilding to the deeper and obſcure parts of the carving, where the gold cannot, or is not thought neceſſary to be laid on. But this practice is at preſent much diſuſed, and inſtead of it, ſuch parts of the work are coloured after the gilding, which treatment is called *matting*.

The work being thus properly prepared, ſet it in a poſition almoſt perpendicular, but declining a little from you, and having the gilding ſize, place all the neceſſary inſtruments above deſcribed ready, as alſo a baſon of clean water ready at hand; wet then the uppermoſt part of the work, by means of a large camel's hair pencil dipped in the water, and then lay on the gold upon the part ſo wet, in the manner above directed for the gilding in oil, till it be completely covered, or become too dry to take the gold. Proceed afterwards to wet the next part of the work, or the ſame over again if neceſſary, and gild it as the firſt, repeating the ſame method till the whole be finiſhed. Some wet the work with brandy, or ſpirit of wine, inſtead of water; but I do not conceive any advantage can ariſe from it that may not be equally obtained by a judicious uſe of water. This manner is moreover much more troubleſome and difficult, as well as expenſive; for only a ſmall part muſt be wet at one time, and the gold laid inſtantly upon it, or the brandy or ſpirits will fly off, and leave the ground too dry to take the gold.

The work being thus gone over with the gilding, muſt be then examined, and, ſuch parts as require it, repaired by wetting them with the camel's hair pencil, and covering them with the gold; but as little as poſſible of the perfect part of the gilding ſhould be wet, as the gold is very apt to turn black in this ſtate. When the repaired part alſo is dry, the work may be matted if it require it; that is, the hollow parts muſt be covered with a colour the neareſt in appearance to gold. For this purpoſe ſome recommend red lead, with a little vermilion ground up with the white of an egg; but I think yellow ochre, or Dutch pink, with red lead, would better anſwer the end; or the *terra di Sienna* very ſlightly burnt or mixed with a little red lead would have a much better effect, and be more durable than any other mixture ſo near the colour of gold in ſhade. Iſinglaſs ſize will likewiſe equally well ſupply the place of the whites of eggs in the compoſition for matting.

The work being thus gilt, it muſt remain about twenty-four hours, and then the parts of it that are deſigned to be burniſhed muſt be poliſhed with the dog's tooth, or with the burniſhers of agate or flint made for this purpoſe; but it ſhould be previouſly tried whether it be of the proper temper as to the dryneſs; for though twenty-four hours be the moſt general ſpace of time in which it becomes fit, yet the difference of ſeaſon, or the degree of wet given to the work, makes the drying irregular, with regard to any fixed period. The way of diſtinguiſhing the fitneſs of the work to take the burniſh, is to try two or three particular parts at a diſtance from each other, which, if they take the poliſh in a kindly manner, the whole may be concluded fit; but if the gold peel off, or be diſordered by the rubbing, the work muſt be deemed not yet dry enough; and if the gold abide well the rubbing, and yet receives the poliſh ſlowly, it is a proof of its being too dry, which ſhould be always prevented by watching the proper time; for the work, when too dry, both requires much more labour to burniſh it, and fails at laſt of taking ſo fine a poliſh.

SECT. V.

Of japanners gilding.

THE japanners gilding is performed by means of gold powder, or imitations of it, cemented to the ground by a kind of gold ſize much of the nature of drying oil; for the making which, there are various recipes followed by different perſons. I ſhall, however, only give one of the more compound, that is much approved, and another very ſimple, but which, nevertheleſs, is equally good for the purpoſe with the moſt elaborate. The more compound gold ſize may be thus made.

" Take of gum animi and aſphaltum each
" one ounce, of red lead, litharge of gold, and
" umbre, each one ounce and a half. Re-
" duce the groſſer ingredients to a fine pow-
" der, and having mixed them, put them,
" together with a pound of linſeed oil, into a
" proper veſſel, and boil them gently, con-
" ſtantly ſtirring them with a ſtick or to-
" bacco-pipe, till the whole appear to be in-
" corporated. Continue the boiling, fre-
" quently ſtirring them, till, on taking out a
" ſmall quantity, it appear thick like tar as
" it grows cold. Strain the mixture then
" through flannel, and keep it carefully ſtop-
" ped up in a bottle, having a wide mouth, for

" uſe. But when it is wanted, it muſt be
" ground with as much vermilion as will give
" it an opake body, and at the ſame time diluted
" with oil of turpentine, ſo as to render
" it of a conſiſtence proper for working freely
" with the pencil."

The aſphaltum does not, I conceive, contribute to the intention of gold ſize, and the litharge of gold, and red lead, are both the ſame thing, with reſpect to this purpoſe, under different names, and neither they nor the umbre neceſſary, but clogging ingredients to the compoſition.

This gold ſize may therefore be equally well, or perhaps better prepared in the following manner.

" Take of linſeed oil one pound, and of
" gum animi four ounces. Set the oil to boil
" in a proper veſſel, and then add the gum
" animi gradually in powder, ſtirring each
" quantity about in the oil, till it appear to
" be diſſolved, and then putting in another,
" till the whole be commixed with the oil.
" Let the mixture continue to boil, till, on
" taking a ſmall quantity out, it appear of
" a thicker conſiſtence than tar, and then ſtrain
" the whole through a coarſe cloth, and keep
" it for uſe. But it muſt, when applied, be
" mixed with vermilion and oil of turpentine,
" in the manner directed for the foregoing."

This gold ſize may be uſed on metals, wood, or any other ground whatever. But before I enter on the particular manner of gilding with it, the preparation of the true and counterfeit gold powders are neceſſary to be ſhewn.

The true gold powder may be well and eaſily made by the following method.

"Take any quantity of leaf gold, and grind "it with virgin honey on a ſtone, till the tex- "ture of the leaves be perfectly broken, and "their parts divided to the minuteſt degree. "Then take the mixture of gold and honey "from off the ſtone; and put it into a China, "or other ſuch baſon, with water, and ſtir it "well about, that the honey may be melted, "and the gold by that means freed from it. "Let the baſon afterwards ſtand at reſt till "the gold be ſubſided; and when it is ſo, "pour off the water from it, and add freſh "quantities till the honey be intirely waſhed "away, after which the gold may be put on "paper and dried for uſe."

A gold powder of a more intenſe yellow colour, brighter than this, may be made by a precipitation from gold diſſolved in *aqua regia*, by means of either green or Roman vitriol, as has been before obſerved in page 289, where directions for the preparation are given.

The German gold powder, which is the kind moſt generally uſed, and, where it is well ſecured with varniſh, will equally anſwer the end in this kind of gilding with the genuine, may be prepared from the ſort of leaf gold, called the *Dutch gold*, exactly in the ſame manner as the true.

The *aurum Moſaicum*, which is tin-coloured, and rendered of a flaky or pulverine texture by a chymical proceſs, ſo as greatly to reſemble gold powder, may be likewiſe uſed in this kind of gilding, and prepared in the following manner.

" Take of tin one pound, of flowers of ſul-
" phur ſeven ounces, and of *ſal Ammoniacus*
" and purified quickſilver each half a pound.
" Melt the tin, and add the quickſilver to it
" in that ſtate, and when the mixture is be-
" come cold, powder it, and grind it with the
" *ſal Ammoniacus* and ſulphur, till the whole
" be thoroughly commixed. Calcine them in
" a mattraſs; and the other ingredients ſu-
" bliming, the tin will be converted into the
" *aurum Moſaicum*; and will be found in the
" bottom of the glaſs like a maſs of bright
" flaky gold powder; but if any black or diſ-
" coloured parts appear in it, they muſt be
" carefully picked or cut out"

The *ſal Ammoniacus* employed ought to be perfectly white and clean, and care ſhould be taken that the quickſilver be not ſuch as is adulterated with lead, which may be known by putting a ſmall quantity in a crucible into the fire, and obſerving, when it is taken out, whether it be wholly ſublimed away, or have left any lead behind it. The calcination may be beſt performed in a coated glaſs body, hung in the naked fire, and the body ſhould be of a long figure, that the other ingredients may riſe ſo as to leave the coloured tin clear of them. The quickſilver, though it be formed into cinnabar along with the ſulphur, need not be waſted, but may be revived by diſtilling it with the addition of quick-lime; for which a very cheap and commodious method and apparatus may be found in a late treatiſe on practical chymiſtry, entitled, *The Elaboratory laid open*, &c.

There are ſome other coarſer powders in imitation of gold, which are formed of precipitations of copper; but as they are ſeldom uſed now for gilding, I ſhall defer ſhewing the manner of preparing them till I come to ſpeak of bronzing, where they more properly occur.

Beſides theſe powders, the genuine leaf or Dutch gold may be uſed with the japanners gold ſize, where a more ſhining and gloſſy effect is deſired in the gilding. But in that kind of gilding which is intended to be varniſhed over, or to be mixed with other japan work or paintings in varniſh, the powders are moſt frequently employed.

The gilding with japanners gold ſize may be practiſed on almoſt any ſubſtance whatever, whether wood, metal, leather, or paper; and there is no further preparation of the work neceſſary to its being gilt than the having the ſurface even and perfectly clean.

The manner of uſing the japanners ſize is this: Put then a proper quantity of it, prepared as above directed, and mixed with the due proportion of oil of turpentine and vermilion, into a ſmall gally-pot, or one of thoſe tin veſſels above deſcribed for containing the colours when uſed for painting in varniſh. Then either ſpread it with a bruſh over the work, where the whole ſurface is to be gilt, or draw with it, by means of a pencil, the proper figure deſired, avoiding carefully to let it touch any other parts. Suffer it afterwards to reſt till it be fit to receive the gold, which muſt be diſtinguiſhed by the finger in the ſame manner as with the fat oil, the having a proper clammineſs or ſticky quality, without being ſo fluid as to take to the finger, being alike the criterion in both caſes. Being found of a proper dryneſs when the gold powders are to be uſed, a piece of the ſoft leather, called *waſh-leather*, wrapt round the fore-finger, muſt be dipped in the powder, and then rubbed very lightly over the ſized work; or, what is much better, the powder may be ſpread by a ſoft camel's hair pencil. The whole being covered, it muſt be left to dry, and the looſe powder may then be cleared away from the gilded part, and collected by means of a ſoft camel's hair bruſh. When leaf gold is uſed, the method of ſizing muſt be the ſame as for the powders; but the point of due dryneſs is very nice and delicate in theſe caſes, for the leaves muſt be laid on while the matter is in a due ſtate, otherwiſe the whole of what is done muſt be ſized and gilt over again.

When more gold ſize is mixed up with the oil of turpentine and vermilion than can be uſed at one time, it may be kept by immerſing it under water till it be again wanted; which is, indeed, a general method of preſerving all kind of paint, or other ſuch compoſitions as contain oily ſubſtances.

SECT. VI.

Of gilding paper, and vellum, or parchment.

THERE are a variety of methods uſed for gilding paper, according to the ſeveral ends it is deſigned to anſwer; but for the moſt part ſize, properly ſo called, and gum water, are uſed as the cements; and the powders are more generally employed than the leaf gold. As I have given the preparation of theſe ſeveral ſubſtances before, it is needleſs to repeat them here; and I ſhall therefore only point out thoſe circumſtances in the manner of their uſe, which are peculiar to the application of them to this purpoſe.

Of the gildings on paper proper to be uſed along with painting in water colours, or freſco.

The gilding proper to be uſed with water colours may be either with the leaf gold, or powder; which laſt, when mixed with the proper vehicle, is called *ſhell-gold.*

The leaf gold is neceſſary in all caſes where a metalline and ſhining appearance is wanted; and it may be laid on the deſigned ground by means either of gum water, or iſinglaſs ſize. The gum water or ſize ſhould be of the weaker kind, and not laid too freely on the ground, and proper time ſhould likewiſe be given for it to dry; the judgment on which muſt be formed, in this caſe, as in the other kinds of gilding, by touching with the finger. The management of the gold alſo is much the ſame in this as in the former; and where a poliſhed appearance is wanting, the dog's tooth, or other kind of burniſher, may be uſed. In the gilding larger ſurfaces, it will be found advantageous to colour the ground with the gall-ſtone; and where colours are to be laid on the gilding, the bruſhing the gold over with the gall of any beaſt will make it take them in a much more kindly manner.

When the gold powders are uſed along with paintings in waters colours, it is previouſly formed ito *ſhell-gold*, (as it is called from its being uſually put into muſcle-ſhells, in the ſame manner as the colours). This ſhell gold is prepared by tempering the gold powder with very weak gum water, to which a little ſoap-ſuds may be put to make the gold work more eaſily and freely. The preparation of the gold powders is before given, p. 440, and that of the gum water p. 180.

Of the gilding proper for the coloured paper for binding books, and other ſuch purpoſes.

This kind of gilding is performed in much the ſame manner as that for mixing with paintings in water colours, except with regard to the following particulars. Firſt, in this caſe, the gilding being intended generally to form ſome figure or deſign, the gum water or ſize, inſtead of being laid on with a bruſh or pencil, is moſt generally conveyed to the ground by means of a wooden plate, or print, and moſt expediently by an engraved roller, which make an impreſſion of the figure or deſign intended. Secondly, as the riſing of the gold from the ſurface of the ground is no diſadvantage in this kind of gilding, as it is in that mixed with paintings, the gum water or ſize may be much ſtronger, which will contribute both to bind the gold firmer, and to give it a ſort of emboſſed appearance that improves the effect. In this kind of gilding the japanners gold ſize may be alſo commodiouſly employed; for, as the paper muſt be moiſtened before it be printed, there is no inconvenience liable to happen from the running of the gold ſize thus uſed. Where the emboſſed appearance is wanted in the greateſt degree, the gold ſize ſhould indeed always be uſed, and in this caſe ſhould be thickened with yellow ochre, mixed with as much red lead as the proper working of the print will admit.

The wooden plates or prints uſed for gilding in this manner, are worked by the hand, and are to be charged with the gum water or ſize, of whatever kind it be, by letting it gently and evenly down on a cuſhion on which the gum water or ſize has been copiouſly ſpread by means of a proper bruſh, and then preſſing it on the paper prepared by moiſtening with water, and laid horizontally with ſome ſheets of other paper under it. Where the rolling print is employed, the gum water or ſize muſt be laid on it by a proper bruſh, immediately out of the pot or veſſel which contains it; but too copious an uſe muſt be avoided for fear of ſpreading it beyond the lines of the deſign or pattern. The ſubſequent management of the gold, whether leaf or powder, muſt be the ſame as in the foregoing kinds of gilding.

It rarely anſwers to uſe the leaf gold in this kind of painting, nor even the true gold powder; but the German powder, or that formed of the leaves called *Dutch gold*, is moſtly employed, and anſwers well enough the purpoſe. The manufacturers of the gilt and marbled papers have not been ſo much cultivated in our own country as it were to be wiſhed, ſince very great ſums have been always annually paid, both to Germany and Genoa, on this account. The improvement of this manufacture is, therefore, a very fit object of attention to that moſt laudable ſociety for the eſtabliſhment and encouragement of uſeful arts, who have offered premiums to thoſe who would give proofs of their endeavours or ſucceſs in parallel inſtances. The ſociety has accordingly given lately a bounty to Mr. Moor, of Newgate-Street, who has eſtabliſhed a manufacture of gilt and flowered paper, which exceeds greatly the foreign in beauty, and is ſold at a cheaper rate than that can be afforded, even when the duty on importation is not paid.

Of gilding proper for letters of gold on paper, and the embelliſhment of manuſcripts.

The moſt eaſy and neat method of forming letters of gold on paper, and for ornaments of writings, is, by the *gold ammoniac*, as it was formerly called; the method of managing which is as follows.

" Take gum Ammoniacum, and powder
" it, and then diſſolve it in water previouſly
" impregnated with a little gum Arabic, and
" ſome juice of garlic. The gum Ammoni-
" cum will not diſſolve in water ſo as to form
" a traſparent fluid, but produces a milky
" appearance; from whence the mixture is
" called

"called in medicine the *lac Ammoniacum.* "With the lac Ammoniacum thus prepared, "draw with a pencil, or write with a pen on "paper or vellum, the intended figure or "letters of the gilding. Suffer the paper to "dry, and then, or any time afterwards, "breathe on it till it be moiſtened, and im- "mediately lay leaves of gold, or parts of "leaves cut in the moſt advantageous man- "ner to ſave the gold, over the parts drawn "or written upon with the lac Ammonia- "cum, and preſs them gently to the paper "with a ball of cotton or ſoft leather. When "the paper becomes dry, which a ſhort time "or gentle heat will ſoon effect, bruſh off, "with a ſoft pencil, or rub off by a fine li- "nen rag, the redundant gold which covered "the parts between the lines of the drawing, "or writing; and the fineſt hair ſtrokes of "the pencil or pen, as well as the broader, "will appear perfectly gold."

It is uſual to ſee in old manuſcripts, that are highly ornamented, letters of gold which riſe conſiderably from the ſurface of the paper, or parchment containing them, in the manner of emboſſed work, and of theſe ſome are leſs ſhining, and others have a very high poliſh. The method of producing theſe letters is of two kinds; the one by friction on a proper body with a ſolid piece of gold, the other by leaf gold. The method of making theſe letters by means of ſolid gold is as follows.

"ſhake cryſtal and reduce it to powder, "temper it then with ſtrong gum water, till "it be of the conſiſtence of paſte; and with "this, form the letters. When they are dry, "rub them with a piece of gold of good "colour, as in the manner of poliſhing, and "the letters will appear as if gilt with bur- "niſhed gold."

Knuckle has, in his fifty curious experiments, given this recipe; but omitted to take the leaſt notice of the manner how theſe letters are to be formed; though the moſt difficult circumſtance in the production of them. It may however be done by means of a ſtamp in this manner. Let the emboſſed figure, either of the ſeparate letters, or of whole words, be cut in ſteel; and, when the ſtamps are to be uſed, anoint each letter carefully with the end of a large feather dipped in oil; but not ſo wet as to leave drops in the hollows of the ſtamps. Fill theſe concave letters, in the ſtamps, with the above mixtures of powdered cryſtal and gum water; and, wiping the other parts of them perfectly clean, place them then on the paper or vellum, laid over ſome ſheets of paper, taking care that the letters may be in the exact poſition where they ought to lie; ſtrike then the ſtamp in a perpendicular direction, but not too forcibly, and take it off in the ſame direction. The letters will be left in their proper places by this means, and will have the ſame proportions as their archetypes in the ſtamps.

Where leaf gold is uſed for making emboſſed letters in manuſcripts, the above compoſition cannot be uſed; but there are ſeveral others which will very well ſupply its place, of which the following has been given as very excellent.

" Take the whites of eggs, and beat them
" to an oily conſiſtence. Then take as much
" vermilion as will be required to thicken the
" whites of the eggs to the conſiſtence of paſte.
" Form the letters of this paſte, by means of
" the ſtamps, in the manner before directed,
" and when they are become dry, moiſten
" them by a ſmall pencil with ſtrong gum-
" water, obſerving not to let it run beyond
" the bounds of the letters. When the gum-
" water is of a proper dryneſs, which muſt
" be judged of by the rule before given, cover
" the letters with leaf gold, and preſs it cloſe
" to every part of them, by cotton or ſoft
" leather. After the gilding is dry, it may be
" poliſhed by the dog's tooth, or the other
" proper burniſhers."

Of gilding proper for the edges of books and paper.

There are ſeveral various methods, with reſpect to the cement uſed, by which the edges of books or paper may be gilt, as ſtrong gum-water, or iſinglaſs ſize, or glover's ſize may be employed; but as the gum-water and weaker ſizes are apt to run beyond the edge, and ſtick the leaves together, iſinglaſs melted with the addition of ſome common proof ſpirit of wine, and a ſixth part of honey or ſugar-candy is greatly preferable; but a third of bole armoniac well powdered muſt be added.

The following compoſition has been likewiſe approved of for this purpoſe.

"Take bole armoniac, and ſugar-candy well
"powdered, each equal parts; mix them with
"the whites of eggs beaten to an oily conſiſt-
"ence, and the cement will be fit for uſe."

In order to the uſing any of theſe cements, the paper, whether it be in quires, or books, ſhould be well cut, and poliſhed on the edges to be gilt, and then ſtrongly ſcrewed down by a preſs; in which ſtate it is to be bruſhed over, firſt with a little of the cement without the ſugar-candy, or the bole; and when that is dry, either with the cement above given, or any other ſolution of gum or ſize with the proper proportion of the bole; after which it may be ſuffered to dry, and then water-poliſhed by rubbing it with a fine linen rag ſlightly moiſtened. It is then in a ſtate fit for receiving the gold, only it may be again gently moiſtened at that time, and the leaves may then be laid on, being cut according to the breadth they are to cover, and preſſed cloſely down by a cotton ball; and after the gilding is thoroughly dry and firm, it may be poliſhed in the manner of the foregoing kinds.

SECT. VII.

Of gilding leather.

LEATHER may be gilded for common occaſions by all the ſame methods which have been given for gilding paper or vellum; except that where the gold ſize is uſed there is no occaſion to wet the leather, to prevent the running of the oil out of the bounds. Either leaf gold or the powders may therefore be employed as well for leather as paper; but, unleſs in ſome fine work, or for very particular purpoſes, the German gold powder would anſwer as well as the true gold. It is needleſs conſequently to repeat here the methods above ſhewn with reſpect to the gilding paper for covers to books, &c. which equally well ſuit for this purpoſe in general; but as there is a manner of gilding leather peculiar to the book-binders, it is requiſite to explain it.

The method of gilding uſed by the book-binder is to have the letters, or copartments, ſcrolls, or other ornaments, cut in ſteel ſtamps; not by ſinking, as in moſt other caſes, but by the projection of the figure from the ground. Theſe ſtamps are made hot, and leaves of gold being laid on the parts accommodated to the pattern or deſign of the gilding, the hot ſtamps are preſſed ſtrongly on the gold and leather, and bind the gold to it in the hollows formed by the ſtamp, the other redundant part of the gold being afterwards bruſhed or rubbed off.

The manner practiſed by the profeſſed leather-gilders for the making hangings for rooms, ſkreens, &c. is not properly *gilding*, but *lacquering*, being done by means of leaf ſilver, coloured by a yellow varniſh, on the ſame principle with the lacquered frames of pictures, &c. which were formerly in uſe. It is an important manufacture, as the leather ornamented in this manner not only admits of great variety of deſigns in emboſſed work, reſembling either gilding or ſilver, but alſo of the addition of paintings of almoſt every ſort. The manner of performing this kind of leather gilding is as follows.

The ſkins are firſt procured in a dry ſtate after the common dreſſing and tanning. Thoſe moſt proper for this purpoſe are ſuch as are of a firm cloſe texture; on which account, calf or goat ſkins are preferable to ſheep. But in that condition they are too hard and ſtiff for gilding in this way. In order therefore to ſoften them, they are firſt put for ſome hours in a tub of water, where they are, during ſuch time, to be frequently ſtirred about with a ſtrong ſtick. They are then taken out, and, being held by one corner, beaten againſt a flat ſtone. They are next made ſmooth by ſpreading them on the ſtone, and rubbing them ſtrongly over by an iron inſtrument reſembling a blade, but with the lower edge formed round, and the upper edge ſet in a wooden handle, paſſing horizontally the whole length of the blade. This inſtrument the workman ſlides on the ſurface of the ſkin as it lies on the ſtone, at the ſame time preſſing and leaning on it with all his weight. When one of the ſkins is finiſhed, another is laid over it, and treated in the ſame manner, and the others over that. The ſkins being thus prepared, are joined together, to form pieces of the ſize required for any particular purpoſe. In order to their joining properly, they are cut into a ſquare, or rather oblong ſquare form. To which end, a ruler or ſquare is uſed, or the ſkins are placed on a table or block, correſponding in ſize and figure to a wooden print of the kind we ſhall have occaſion to ſpeak of below, and as much of the ſkins is taken off as leaves it of the form and dimenſions of the table or block. Any defective parts, or holes in the ſkin, are then to be made good; which is done by paring away with a penknife, half the thickneſs of the ſkin for ſome little ſpace round the whole, or defective part; putting a patch, or correſpondent piece of the ſame kind of ſkin over it. This patch, or piece, is to have a margin pared to half the thickneſs, to ſuit the pared part of the ſkin, and is then to be fixed in its place, by means of ſize made of parchment, or glover's cuttings, in the manner deſcribed before, p. 432.

After the ſkins are thus prepared, the next operation is the ſizing them, which is done by means of a kind of ſoft glue, or ſtiff ſize, that anſwers to the gold ſize, uſed in other kinds of gilding or ſilvering prepared from parchment or glover's cuttings. This is, in fact, the ſame with that directed to be uſed for joining the pieces, only it muſt be reduced by longer boiling to a thicker conſiſtence, which ſhould be that of a very ſtiff jelly.

To ſize a ſkin, or piece, the workman takes a piece of the ſize of the bigneſs of a nut; which, however, he does not uſe whole, but cuts into two parts. With one of theſe parts he rubs all the ſkin, or piece of leather, ſtrongly; and when it is by this means ſpread over the whole ſurface of the leather, he rubs it with the palm of his hand to diſperſe it more equally and uniformly over every part. To the effecting this end, the heat of the hand contributes as well as the motion, as it melts the ſize to a certain degree of fluidity, and renders it conſequently more capable of being diffuſed over the whole ſurface. The workman then leaves the ſkin for ſome time to dry, and afterwards ſpreads the other part of the ſize on it, in the ſame manner as the firſt, which finiſhes the operation of ſizing. It is neceſſary to allow ſome ſpace of time betwixt the laying on the two parts of the ſize; for if the whole was laid on together, or the firſt part before the other was dry to a certain degree, the whole would diſſolve, and be forced forwards before the hand, inſtead of being ſpread by it. In the proſecution of this buſineſs, the workman therefore, as ſoon as he has ſpread the firſt part of the ſize, takes another ſkin and treats it in the ſame manner, which filling up the interval of time proper for drying the firſt, he returns then to that, and puts on the other part of the ſize, and by this alternative treatment of them employs the whole of his time without any loſs, by waiting till either be dry. The ſide of the ſkin on which the hair grew, or what is called the *grain* of the leather, is always choſen for receiving the ſize and ſilver. This is neceſſary to be obſerved, becauſe that ſide is evener and of a cloſer texture than the other.

The ſkins, being thus ſized, are ready for receiving the leaves of ſilver, which are thus laid on. The workman who ſilvers them ſtands before a table, on which he ſpreads two ſkins before they are dry after the ſizing. On the ſame table, on the right hand, he puts alſo a large book of leaf ſilver on a board, which, near one end of it, has a peg ſufficiently long to raiſe it in ſuch manner as to make it ſlope like a writing-deſk.

The book being thus placed, he takes out one by one the leaves of ſilver, and lays them on the ſkin previouſly ſized as above. This he does by means of a ſmall pair of pincers, formed by two little rods of wood faſtened together

gether at one end, and glued to a ſmall piece of wood, cut into the form of a triangle, intended to keep the ends of the two rods at a diſtance from each other, and to make them anſwer the purpoſe, when preſſed by the fingers, of taking hold of the leaves of ſilver. On the ſide of the piece in which the rods are joined to form the pincers, there is put a kind of turf, or ſmall bruſh, of an irregular form, made of foxes, or any other kind of ſoft hair. With theſe pincers the workman takes hold of one of the leaves in the book, and puts it on a piece of cartoon, larger than the leaf, of a figure nearly ſquare, and which has the corners of the end, that is to be placed in the hand of the workman, bent. This piece of cartoon is called a *palette*. The workman takes it in his left hand, and having put on it a leaf of ſilver, he turns it downward, and lets the leaf fall on the ſkin, ſpreading it as much as he can, and bringing, as near as poſſible, the ſides of it to be parallel to thoſe of the ſquare of leather, or ſkin. If it happen that any part of it gets double, or is not duly ſpread, he ſets it right, raiſes it ſometimes, and puts it in its place, or rubs it gently with the kind of bruſh, or hair pencil, which is at the end of the pincers; but moſt generally, the workman only lets the leaf fall in its place, ſpread out on the ſurface of the leather, without either touching or preſſing it, except in the caſe we ſhall mention below. After he has done with this leaf, he lays a new one in the ſame line, and continues the ſame till ſuch line be complete. He then begins cloſe to the edge of this row of leaves, and forms another in the ſame manner, and goes on thus till the whole ſkin be entirely covered with the leaf ſilver. This work is very eaſily and readily performed, as the leaves, which are of a ſquare form, are put on a plain ſurface, which is alſo rectangular. The ſkin being thus covered with the ſilver, the workman takes a fox's tail, made into the form of a ball at the end, and uſes it to ſettle the leaves by preſſing and ſtriking them to make them adhere to the ſize, and adopt themſelves exactly to the places they are to cover. He afterwards rubs the whole ſurface gently with the tail, without ſtriking, which is done to take off the looſe and redundant parts of the ſilver, and at the ſame time to move them to thoſe places of the ſurface where there was before any defect of the ſilver; and where, conſequently, the ſize being bare, theſe will now take. The reſt of the looſe ſilver is bruſhed forwards to the end of the table, where a bag or linen cloth is placed to receive it.

The ſkins, when they are thus ſilvered, are hung to dry on cords, fixed by the ends to oppoſite walls, at ſuch height as to ſuſpend the ſkins out of the way of the workman. To hang them on theſe cords, a kind of croſs is uſed, formed of a ſtrong ſtick, with a ſhorter piece of the ſame fixed croſs-wiſe at the end of it, over which the ſkin being hung without any doubling, and with the ſilvered outwards, it is conveyed and transferred to the cord in the ſame ſtate. The ſkins are to dry in this condition a longer or ſhorter time, according to the ſeaſon and the weather. In ſummer four or five hours is ſufficient, or thoſe ſkins which have been ſilvered in the morning may remain till the evening, and thoſe in the evening till next morning; but in winter a longer time is required, according to the ſtate of the weather. There is no occaſion, nevertheleſs, to wait till they be entirely dry, as they may be put in any back yard or garden expoſed to the wind, and the heat of the ſun. For this purpoſe they ſhould be put over two boards joined together, where they muſt be kept ſtretched out by means of ſome nails. But in this caſe the ſilvered ſide muſt be next the boards, in order to prevent any dirt from falling on it, and ſticking to the ſize, which would hinder their taking well the burniſh that will be mentioned below. The heat and the dryneſs of the air muſt determine alſo the time of their hanging in this ſtate; but experience alone can teach how to judge of this point. It is proper the ſkin ſhould be free from moiſture, but yet that they ſhould retain all their ſoftneſs; in ſummer this will happen in a few hours, and they will be then in a condition to be burniſhed.

The burniſher which is uſed for this purpoſe is a flint, of which various figures may be allowed, and which muſt be mounted differently with a handle, according to the difference of the figure. A cylindrical form is often choſen, in which caſe one of the ends ſhould be of a round figure, of about an inch and a half diameter, and have the ſurface extremely ſmooth, as the poliſhing is performed with this ſurface. The flint is fixed in the middle of a piece of wood of a foot length, the whole of which length is neceſſary to its ſerving as a handle, or the workman takes hold of it at each end with each of his hands, thoſe parts being roundiſh, and the middle being left of a greater thickneſs, in order to admit of a hole of a proper depth for receiving the flint, ſo as to keep it quite firm and ſteady. All the art required in the manner of burniſhing is to rub the leaf ſilver ſtrongly; for which purpoſe the workman applies both hands to the burniſher, dwelling longer on thoſe parts which appear moſt dull. In order to perform this operation, the ſkin is put and ſpread even on a ſmooth ſtone of a requiſite ſize, placed on a table, where it may be ſo firm and ſteady as to bear all the force of preſſure the workman can give in ſliding the burniſher backwards and forwards over every part of the ſkin. It would ſave a great deal of labour to employ, inſtead of this method of burniſhing, that uſed by the poliſhers of glaſs, and alſo by the card-makers. This method conſiſts in fixing the burniſher at the end of a ſtrong crooked ſtick, of which the other end is faſtened to the cieling. The ſtick being ſo diſpoſed as to act as a ſpring, of which the force bears on the ſkin, it exempts the workman from this part of the labour, and leaves him only that of ſliding the burniſhers along the ſkin in the directions the poliſhing requires. The objections to this method are, that ſome parts of the ſkin require a greater preſſure than others, and that ſometimes dirt ſticking to the ſize, which paſſes through the joining of the ſilver, will ſcratch the work, if the workman in going along did not ſee and remove it, which he cannot ſo well do in uſing the ſpring burniſher. But certainly theſe inconveniences have obvious remedies when they are underſtood. The uſing the ſpring burniſher for the greateſt part of the work does not prevent taking the aid of the common one for finiſhing, if any parts that appear imperfectly poliſhed ſhall render it neceſſary, and the workman may well afford the trouble of examining the ſkin, and cleanſing it thoroughly by the labour he will ſave in this way; or, perhaps, it is always beſt to do this office before any kind of poliſhing be begun, rather than to leave it to be done during the poliſhing.

In ſome manufactures, the burniſhing is performed by paſſing the ſilvered ſkins betwixt two cylindrical rollers of ſteel with poliſhed faces. If this be well executed it muſt give a conſiderable brilliance to the ſilver, and take away all thoſe warpings and inequalities in the leather, which tend to render the ſilvered ſurface leſs equal and ſhining.

The ſkins or leather being thus ſilvered and burniſhed, are now prepared to receive the yellow lacquer or varniſh, which gives the appearance of gilding. The perfection of this work depends obviouſly, in a great degree, on the colour and other qualities of the compoſition uſed as ſuch varniſh, for which different artiſts in this way have different recipes, each pretending, in general, that his own is beſt, and making conſequently a ſecret of it. The following is, however, at leaſt equal to any hitherto uſed, and may be prepared without any difficulty, except ſome little nicety in the boiling.

" Take of fine white reſin four pounds " and a half, of common reſin the ſame " quantity, of gum ſandarac two pounds and " a half, and of aloes two pounds. Mix " them together, after having bruiſed thoſe " which are in great pieces, and put them " into an earthen pot over a good fire made " of charcoal, or over any other fire where " there is no flame. Melt all the ingredients " in this manner, ſtirring them well with a " ſpatula, that they may be thoroughly mixed " together, and be prevented alſo from ſticking " to the bottom of the pot. When they " are perfectly melted and mixed, add gradu-

" ally to them ſeven pints of linſeed oil, and
" ſtir the whole well together with the ſpatula.
" Make the whole boil, ſtirring it all the time,
" to prevent a kind of ſediment that will form,
" from ſticking to the bottom of the veſſel.
" When the varniſh is almoſt ſufficiently boil-
" ed, add gradually half an ounce of litharge,
" or half an ounce of red lead, and when they
" are diſſolved, paſs the varniſh through a li-
" nen cloth, or flannel bag."

The time of boiling ſuch a quantity of varniſh may be, in general, about ſeven or eight hours. But as the force of the heat and other circumſtances may vary, it does not admit of any preciſe rule. The means of judging of this is by taking a little quantity out of the pot with a ſilver ſpoon, or other ſuch inſtrument, and touching it with the finger; when, if the varniſh appear, on cooling, of the conſiſtence of a thick ſyrup, become ſoon after ropy, and then drying, glue the fingers together, and give a ſhining appearance, it may be concluded the time of boiling is ſufficient. But if theſe ſigns are found wanting, the contrary muſt be inferred, and the boiling muſt be continued till they do ariſe. When the quantity of ingredients is diminiſhed, the time of boiling may alſo be contracted. A pint of oil, and a correſpondent proportion of fine reſin and aloes, has produced a varniſh perfectly good in an hour and a half.

In this proceſs it is very neceſſary to have a pot that will not be half filled with all the ingredients, and alſo to guard with the greateſt caution againſt any flame coming near the top of the pot, or the vapour which riſes from it during the boiling; for it is of ſo combuſtible a nature, it would immediately take fire, and the ingredients themſelves would burn in ſuch a manner as would not only defeat the operation, but occaſion the hazard of other inconveniences.

The varniſh thus prepared attains a brown appearance; but, when ſpread on ſilver, gives it a colour greatly ſimilar to that of gold. If, however, it ſhould not be found after this proceeding that the force of yellow was ſufficiently ſtrong, an addition of more aloes muſt be made before the boiling be diſcontinued. Care muſt be taken, nevertheleſs, in doing this, not to throw in a large lump at once; becauſe ſuch an effervеſcence is excited, in that caſe, as would endanger the varniſh riſing over the edge of the veſſel, and producing a flame that would inſtantly make the whole take fire. On the other hand, if the varniſh ſeem too ſtrong of the colour, ſandarac muſt be added with the ſame precaution, which, increaſing the quantity of varniſh, will dilute the colour.

The laying the lacquer, or varniſh, on the ſilvered leather, is performed in the open air, and ſhould be done in ſummer, when it is hot and dry. It is thus performed. The ſkins are again to be ſtretched and faſtened with nails to the ſame boards on which they were before fixed to complete the drying after the ſilvering; but with this difference, that the ſilvered ſide muſt be outwards. Eighty or twenty ſkins may be treated thus at the ſame time, there being two or three on each board. All the boards ſhould be then ranged on treſſels parallel to each other, in ſuch manner that all, both of them and the ſkins, may be cloſe to each other. Every thing being thus prepared, the principal workmen ſpread ſome of the whites of eggs over each ſkin. The uſe of this is to fill up ſmall inequalities in the ſurface of the ſkin, and to prevent the varniſh paſſing through the interſtices of the ſilver, and being abſorbed by the leather. Some omit this, and with advantage, if theſe inconveniences could be avoided without it, as it renders the varniſh more apt to crack and peel off the ſilver. But where it is omitted, the varniſh ſhould be of a thicker conſiſtence, the ſurface of the leather of a firm denſe texture, and the leaves of ſilver of a greater thickneſs than the common. When the white of eggs is dry, the workman, who lays on the varniſh, ſets it on the table before him in a pot, being, as before directed, pretty near the conſiſtence of a thick ſyrup. He then dips the four fingers of one of his hands in the varniſh, and uſes them as a pencil to ſpread it on the ſkin. In doing this, he holds the fingers at a ſmall but equal diſtance from each other, and putting the ends of them on the ſkin near one of the edges of it, and he then moves his hand ſo that each finger paints a kind of S with the varniſh, from one end of the ſkin to the other. He afterwards dips his fingers again in the varniſh, and repeats the ſame operation again on the next part of the ſkin, till the whole be gone over in the ſame manner. This might be done with a pencil or proper bruſh, but the workman finds the uſing the fingers only to be the readieſt method for diſtributing the varniſh equally over the ſkin. After the varniſh is thus laid on the ſkin, it is to be ſpread, which is ſtill done by the hand ſolely. The method is to rub the flat of the open hand over every part of the ſkin on which the varniſh has been put by the fingers, and by that means diffuſe it evenly over every part. After this, it is to be immediately beaten by ſtrokes of the palms of the hands, which are to be frequently repeated on every part in general, but in a greater degree on thoſe places where the varniſh appears to lie thicker than on the reſt; and in doing this, both hands are, for diſpatch, employed at the ſame time. When this operation is finiſhed, the ſkins are ſtill to be left on the boards where they were ſtretched and nailed; and thoſe boards are therefore, either continued till that time on the treſſels where the varniſh was put on the ſkin, or, if they be wanted for freſh ſkins, taken off, and fixed up againſt the

wall

wall of the place, or any other proper ſupport. The time of drying depends of courſe on the heat of the ſun and weather, but at a ſeaſonable time does not exceed a few hours. It is to be known, as to each particular parcel of ſkins, by examining them with the finger. If on touching them they be found free from any ſtickineſs, or, in the ſtyle of workmen, tickineſs, or, that the finger makes no impreſſion on the varniſh, they may be concluded ſufficiently dry, and the contrary when they are found to be otherwiſe. This coat of varniſh being dry, the ſkins are to be again put on the treſſels as before, and another coat laid on exactly in the ſame manner as the firſt. In doing this, examination muſt be made whether any of the ſkins appear ſtronger or weak coloured than the others, in order that the defect be now remedied, by making this coat thicker or thinner, as may appear neceſſary. When this coat is dry, the varniſh for producing the appearance of gilding is completed; and if it has been well performed, the leather will have a very fine gold colour, with a conſiderable degree of poliſh or brightneſs.

When there is an intention to have one part of the leather ſilver, and the other gold, a pattern is formed on the ſurface by printing, calking, or ſtamping a deſign on the ſurface after the ſilvering. The ſkin is then to be varniſhed, as if the whole were intended to be gold; but after the laſt coat, inſtead of drying the

the varniſh, it is to be immediately taken off that part which is intended to be ſilver, according to the deſign printed or calked upon it, by a knife, with which the workman ſcrapes off all that he can without injuring the ſilver, and afterwards by a linen cloth, with which all that remains is endeavoured to be wiped or rubbed off.

The ſkins, being thus ſilvered and varniſhed, are made the ground of various deſigns for emboſſed work and painting. The emboſſed work or relief is raiſed by means of printing with a rolling-preſs, ſuch as is uſed for copper-plates; but the deſign is here to be engraved on wood. The painting may be of any kind, but oil is principally uſed, as being durable and moſt eaſily performed. There is nothing more neceſſary in this caſe than in painting on other grounds, except that where varniſh or water is uſed, the ſurface be clean from any oily or greaſy matter.

SECT. VIII.

Of gilding of glaſs without annealing or burning

GLASS may be gilt by applying, as a cement, any gold ſize, or other ſize, gum water, or varniſh; and, when it is of a proper degree of dryneſs, laying on the gold, as in the other methods of gilding. The work may alſo be poliſhed afterwards in the ſame manner, if the burniſhed appearance be deſired; but where that is intended, it is proper to add bole armoniac, chalk, or other ſuch ſubſtance, to the cement.

When drinking glaſſes are to be gilt, without burning, the cement ſhould be either ſome gold ſize formed of oil, or ſome kind of varniſh compounded of the gum reſins, that will not diſſolve in water, but require either ſpirit of wine or oil of turpentine for their ſolution. At preſent, nevertheleſs, this is not only neglected by thoſe who gild drinking-glaſſes for ſale, but glaſſes gilded with gum Arabic, or the ſizes which will diſſolve in water, are impoſed upon the public for the German glaſſes gilt with the annealed gold, and ſold at a dear rate under that pretence; though after they have been uſed for a very ſhort time, the gold peels and rubs off in ſpots when the glaſſes are cleaned, and renders them very unſightly. As the glaſſes with gilt edges are at preſent much in faſhion, and the true kind are brought from Germany, or elſewhere, the incitement of the cultivating this branch of gilding here would not be an unfit object of the premiums of the worthy ſociety for the encouragement of arts; ſince, for the doing this work in perfection, there is nothing more wanting than that dexterity of the manœuvre which ariſes from a little practice in matters of this kind, as I have before ſhewn in treating particularly of this article, p. 374, by a general method, and explained fully there, and elſewhere, the nature of the ſubſtances proper to be employed, as far as reſpects this operation.

CHAP. II.

Of ſilvering.

SILVERING may be practiſed on the ſame ſubſtances, and by all the ſame methods, either with leaf or powder, we have before pointed out with regard to gilding; variation being made in a few circumſtances below mentioned. It is nevertheleſs but ſeldom uſed, notwithſtanding the effect would be very beautiful and proper in many caſes; and there is an extreme good reaſon for ſuch a neglect of it. This reaſon is, its tarniſhing in a very ſhort time, and acquiring frequently, beſides the general depravity of the whiteneſs, ſuch ſpots of various colours as render it very unſightly; and this tarniſh and ſpecking is not only the conſtant reſult of time, but will be often produced inſtantly by any extraordinary moiſture in the air, or dampneſs, as well as by the fumes and effluvia of many bodies which may happen to approach it.

Wherever, therefore, ſilvering is admitted, a ſtrong varniſh ought to be put over it; and this even is not ſufficient wholly to ſecure it from this defective conſequence. The varniſh muſt be ſome of the compoſitions of maſtic, ſandarac, the gums animi or copal, and white reſin; (the particular treatment of which in the forming varniſhes will be found in other parts of this work) for the other ſubſtances uſed for compounding varniſhes are too yellow. Some put a coat of iſinglaſs-ſize over the ſilver; but, beſides that, the ſize itſelf injures the whiteneſs in time, by turning yellow, it preſerves the ſilver but in a ſmall degree. Experience has ſhewn, in the caſe of the ſilvered leather, what the varniſh may be compoſed of that anſwers beſt for this purpoſe, and the kind before given, p. 463, under that head, may be applied to other purpoſes.

The methods of making the ſilver powders are alſo the ſame as thoſe of gold, except with regard to one of the German powders, which is correſpondent both in its appearance and uſe, abating the difference of colour, to the *aurum Moſaicum*, or *muſivum*; whence it has been indeed, though improperly, called the *argentum muſivum*. The proceſs for this being, therefore, different from any before given, it is proper to inſert it fully, as follows.

" Take of very pure tin one pound. Put
" it into a crucible, and ſet it on a fire to
" melt;

“ melt; when it begins to run into fuſion, “ add to it an equal proportion of biſmuth or “ tin glaſs, and ſtir the mixture with an iron “ rod, or the ſmall end of a tobacco-pipe, till “ the whole be intirely melted and incorpo- “ rated. Take the crucible then from the fire, “ and after the melted compoſition is become “ a little cooler, but while it is yet in a fluid “ ſtate, pour into it a pound of quickſilver “ gradually, ſtirring it in the mean-time, that “ the mercury may be thoroughly conjoined “ with the other ingredients. When the whole “ is thus commixed, pour the maſs out of the “ crucible on a ſtone, where, as it cools, it “ will take the form of an amalgama, or me- “ talline paſte, which will be eaſily bruiſed into “ a flaky powder, and is then fit for uſe.”

This powder may be either tempered in the manner of the ſhell gold, with gum water, or rubbed over a ground properly ſized, according to any of the methods above directed for gold powder, and it will take a very good poliſh from the dog's tooth or burniſhers, and hold its colour much better, with a ſlight coat of varniſh over it, than any true ſilver powder or leaf.

The ſizes for ſilvering ought not to be mixed, as in the caſe of gold, with yellow, or bole armoniac, but with ſome white ſubſtance, whoſe effect may prevent any ſmall failures in the covering the ground with the ſilver from being ſeen, in the ſame manner as the yellow ſubſtances do the gold. This may be done with flake white, or white lead, when the ſizes formed of oil are uſed; but whiting is the proper matter in the burniſh ſize for ſilvering, or wherever the glover's or parchment ſize is uſed. Some recommend tobaccopipe-clay in the place of whiting, and add a little lamp-black to give a ſilver-like greyiſhneſs to the compoſition.

Leather is ſilvered by thoſe who have the manufactures of hangings, ſkreens, &c. though not ſo frequently with a view to the retaining its own colour as to produce the imitation of gilding, of which the whole proceſs is before given, p. 454. In ſome caſes, nevertheleſs, the appearance of ſilver is retained, and it is therefore proper to take ſome notice of the manner of performing this work. The proceeding in ſilvering the leather is to be in all reſpects the ſame as when it is to have the appearance of gilding (of which the particular manner has been before ſhewn under the article of gilding leather) till that part of the proceſs where the varniſh or lacquer, which is to give the yellow colour, is to be laid on. Inſtead of this yellow varniſh, a clear colourleſs one is to be ſubſtituted, where the appearance of ſilver is to be preſerved; but this is neceſſary only in order to prevent the tarniſhing and diſcolouring, which of courſe happens in a ſhort time to ſilver expoſed in a naked and undefended ſtate to the air. The moſt common varniſh uſed for this purpoſe is only parchment ſize, prepared as above directed, page 432, which is preferred to others on account of its cheapneſs. This is made warm in order to render it fluid, and then laid on with a ſponge inſtead of a pencil or bruſh. There is no reaſon, however, as this kind of varniſh is liable to ſuffer by moiſture, and grow foul and diſcoloured, that better kinds, ſuch as thoſe of Martin, or others, which are uſed for *papier mache*, wood, &c. ſhould not be employed here, provided they be colourleſs. The more hard and tranſparent, and the more they are of a reſinous nature, the more brilliant and white, and the more durable will be the ſilvery and poliſhed appearance of the ſilvered leather. Some, inſtead of parchment ſize, uſe that made of iſinglaſs, which may be prepared according to the method laid down p. 432. This reſiſts moiſture, and will keep its colour and tranſparency better than the other kinds of ſize; but all of them grow yellow and cloudy with time, eſpecially if any damp or moiſture have acceſs to them. Indeed ſilver, ſecured even by the beſt varniſh, will ſtill in time take a tarniſh and loſe its beauty, and therefore the giving the leaf ſilver on leather the appearance of gold, even though attended with ſome additional expence, is preferable in moſt caſes.

Leather ſilvered in this manner may be ornamented by printing in relief, and by painting in the ſame manner as that repreſenting gilding, though, on account of the want of durability, this is much ſeldomer practiſed. It is poſſible that ſome amalgama of quickſilver, or other compoſition might be found, that would have the reſemblance of ſilver, and yet reſiſt tarniſhing, which would not only be a great improvement, by the furniſhing a durable kind of ſilvering for leather, paper, &c. but alſo ſave part of the expence of leaf ſilver for a ground for gilded leather. This has been attempted in France with ſome ſucceſs, but not to the degree of perfection wiſhed for.

CHAP. III.

Of bronzing.

BRONZING is colouring by metalline powders, plaiſter, or other buſts and figures, in order to make them appear as if caſt of copper or other metals.

This is ſometimes done by means of cement, and ſometimes without, in the inſtance of plaiſter figures; but the bronzing is more durable and ſecure when a cement is uſed.

The gold powders, and the *aurum Moſaicum*, we have before given the preparation of, are frequently employed for this purpoſe; but the proper bronzing ought to be of a deeper and redder colour, more reſembling copper, which effect may be produced by grindng a very ſmall quantity of red lead with theſe powders; or the proper powder of copper may be uſed, and may be prepared as follows.

“ Take filings of copper, or ſlips of cop-“ per-plates, and diſſolve them in any kind of “ *aqua fortis* put into a glaſs receiver, or other “ proper formed veſſel. When the *aqua fortis* “ is ſaturated with the copper, take out the “ ſlips of the plates; or, if filings were uſed, “ pour off the ſolution from what remains “ undiſſolved, and put into it ſmall bars of “ iron, which will precipitate the copper from “ the *aqua fortis* in a powder of the proper “ appearance and colour of copper. Pour off “ the water then from the powder, and waſh “ it clean from the ſalts by ſeveral ſucceſſive “ quantities of freſh water.”

Where the appearance of braſs is deſigned, the gold powders, or the *aurum Moſaicum* may be mixed with a little of the powder called *argentum muſivum*, of which the preparation is above given.

Where the appearance of ſilver is wanted, the *argentum muſivum* is the beſt and cheapeſt method, particularly as it will hold its colour much longer than the true ſilver uſed either in leaf or powder.

Where no cement is uſed in bronzing, the powder muſt be rubbed on the ſubject intended to be bronzed, by means of a piece of ſoft leather, or fine linen rag, till the whole ſurface be coloured.

The former method of uſing a cement in bronzing was to mix the powders with ſtrong gum water, or iſinglaſs ſize; and then with a bruſh, or pencil, to lay them on the ſubject. But at preſent ſome uſe the japanners gold ſize, and proceed in all reſpect in the ſame manner as in gilding with the powders in other caſes; for which ample directions have been before given.

This is the beſt method hitherto practiſed. For the japanners gold ſize binds the powders to the ground, without the leaſt hazard of peeling or falling off; which is liable to happen when the gum water, or glover's, or iſinglaſs ſizes are uſed. Though, notwithſtanding the authority of the old practice for the contrary, even theſe cements will much better ſecure them when they are laid on the ground, and the powders rubbed over them, than when both are mixed together, and the effect, particularly of the *aurum Moſaicum*, will be much better in this way than the other. The gold ſize ſhould be ſuffered, in this caſe, to approach much nearer to dryneſs than is proper in the caſe of gilding with leaf gold, as the powders would otherwiſe be rubbed againſt it in the laying them on.

The factitious ſilver powder, called the *argentum muſivum*, may, as above-mentioned, be applied in the manner of bronze, by thoſe whoſe caprice diſpoſes them to ſilver figures or buſts. But it is the only ſort of ſilver powder that ſhould be uſed in this way, for the reaſon above given, and all ſuch kind of ſilvering is much better omitted; for the whiteneſs itſelf of plaiſter in figures or buſts, and much more a gloſſy or ſhining whiteneſs, is injurious to their right effect, by its eluding the judgment of the eye, with reſpect to the proper form and proportion of the parts, from the falſe and pointed reflections of the lights, and the too faint force of the ſhades. To remove which inconvenience it is probable was the firſt inducement to bronzing.

CHAP. IV.

Of japanning.

SECT. I. *Of japanning in general.*

BY japanning is to be here underſtood the art of covering bodies by grounds of opake colours in varniſh, which may be either afterwards decorated by paintings or gilding, or left in a plain ſtate. This is not at preſent practiſed ſo frequently on chairs, tables, and other furniture of houſes, except tea-waiters, as formerly. But the introduction of it for ornamenting coaches, ſnuff-boxes, and ſkreens, in which there is a rivalſhip betwixt ourſelves and the French, renders the cultivation and propagation of this art of great importance to commerce. I ſhall therefore be more explicit in ſhewing the methods both now and formerly in uſe, with the application of each to the ſeveral purpoſes to which they are beſt adapted, and point out at the ſame time ſeveral very material improvements that are at preſent enjoyed only by particular perſons, or not at all hitherto brought into practice.

The ſubſtances which admit of being japanned are almoſt every kind that are dry and rigid, or not too flexible, as wood, metals, leather, and paper prepared.

Wood and metals do not require any other preparation but to have their ſurfaces perfectly even and clean. But leather ſhould be ſecurely ſtrained either on frames, or on boards, as its bending or forming folds would otherwiſe crack and force off the coats of varniſh. Paper alſo ſhould be treated in the ſame manner, and have a previous ſtrong coat of ſome kind of ſize; but it is rarely made the ſubject of japanning till it is converted into *papier mache*, or wrought, by other means, into ſuch form, that its original ſtate, particularly with reſpect to flexibility, is loſt.

One principal variation in the manner of japanning is the uſing or omitting any priming or undercoat on the work to be japanned. In the older practice, ſuch priming was always uſed, and is at preſent retained in the French manner of japanning coaches and ſnuff-boxes of the *papier mache*. But in the Birmingham manufacture here, it has been always rejected. The advantage of uſing ſuch priming or undercoat is, that it makes a ſaving in the quantity of varniſh uſed; becauſe the matter of which the priming is compoſed fills up the inequalities of the body to be varniſhed, and makes it eaſy, by means of rubbing and water-poliſhing, to gain an even ſurface for the varniſh. This was therefore ſuch a convenience in the caſe of wood, as the giving a hardneſs and firmneſs to the ground was alſo in the caſe of leather, that it became an eſtabliſhed method, and is therefore retained, even in the inſtance of the *papier mache*, by the French, who applied the received method of japanning to that kind of work on its introduction. There is, nevertheleſs, this inconvenience always attending the uſe of any undercoat of ſize, that the japan coats of varniſh and colour will be conſtantly liable to be cracked and peeled off by any violence, and will not endure near ſo long as the bodies japanned in the ſame manner, but without any ſuch priming. This may be eaſily obſerved in comparing the wear of the Paris and Birmingham ſnuff-boxes; which latter, when good of their kind, never peel, or crack, or ſuffer any damage, unleſs by great violence, and ſuch a continued rubbing, as waſtes away the ſubſtance of the varniſh; while the japan coats of the Pariſian boxes crack and fly off in flakes, whenever any knock or fall, particularly near the edges, expoſes them to be injured. But the Birmingham manufactures, who originally practiſed the japanning only on metals, to which the reaſon above given for the uſe of priming did not extend, and who took up this art of themſelves as an invention, of courſe omitted at firſt the uſe of any ſuch undercoat; and not finding it more neceſſary in the inſtance of *papier mache* than on metals, continue ſtill to reject it; on which account the boxes of their manufacture are, with regard to the wear, greatly better than the French.

The laying on the colour varniſh inſtead of gum water, is alſo another variation from the method of japanning formerly practiſed. But the much greater ſtrength of the work, where they are laid on in varniſh or oil, has occaſioned this way to be exploded, with the greateſt reaſon, in all regular manufactures. However, they who may practiſe japanning on cabinets, or other ſuch pieces, as are not expoſed to much wear or violence, for their amuſement only, and conſequently may not find it worth their while to encumber themſelves with the preparations neceſſary for the other methods, may paint with water colours on an undercoat laid on the wood, or other ſubſtance, of which the piece to be japanned is formed, and then finiſh with the proper coats of varniſh, according to the methods below taught. If the colours are tempered with the ſtrongeſt iſinglaſs ſize and honey, inſtead of gum water, and laid on very flat and even; the work will not be much inferior in appearance to that done by the other method, and will laſt as long as the common old Japan work, except the beſt kinds of the true Japan.

It is practiſed likewiſe, in imitation of what is ſometimes done in the Indian work, to paint with water colours on grounds of gold; in which caſe the iſinglaſs ſize, with ſugar-candy or honey, as above directed, is the beſt vehicle.

Imitations are alſo made of Japan work, by colouring prints, gluing them to wood-work, and then giving them a ſhining appearance, by the uſe of ſome white varniſh.

Of japanning grounds.

The proper Japan grounds are either ſuch as are formed by the varniſh and colour, where the whole is to remain of one ſimple colour, or by the varniſh either coloured or without colour, on which ſome painting, or other decoration, is afterwards to be laid. It is neceſſary, however, before I proceed to ſpeak of the particular grounds, to ſhew the manner of laying on the priming or undercoat, where any ſuch is uſed.

This priming is of the ſame nature with that called *clear-coating*, (or vulgarly *clear-coaling*) practiſed erroneouſly by the houſe-painters, and conſiſts only in laying on, and drying in the moſt even manner, a compoſition of ſize and whiting. The common ſize has been generally uſed for this purpoſe; but where the work is of a nicer kind; it is better to employ the glovers or the parchment ſize, and if a third of iſinglaſs be added, it will be ſtill better; and if not laid on too thick, much leſs liable to peel and crack. The work ſhould be prepared for this priming by being well ſmoothed with the fiſh-ſkin, or glaſs ſhaver; and, being made thoroughly clean, ſhould be bruſhed over once or twice with hot ſize, diluted with two-thirds of water, if it be of the common ſtrength. The priming ſhould then be laid on with a bruſh as even as poſſible, and ſhould be formed of a ſize whoſe conſiſtence is betwixt the common kind and glue, mixed with as much whiting as will give it a ſufficient body of colour to hide the ſurface of whatever it is laid upon, but not more.

If the ſurface be very even on which the priming is uſed, two coats of it, laid on in this manner, will be ſufficient; but if, on trial with a fine rag wet, it will not receive a proper water poliſh, on account of any inequalities not ſufficiently filled up and covered, two or more coats muſt be given it; and whether a greater or leſs number be uſed, the work ſhould be ſmoothed, after the laſt coat but one is dry, by rubbing it with the Dutch ruſhes. When the laſt coat is dry, the water poliſh ſhould be given, by paſſing over every part of it with a fine rag gently moiſtened, till the whole appear perfectly plain and even. The priming will then be completed, and the work ready to receive the painting, or coloured varniſh; the reſt of the proceedings being the ſame in this caſe as where no priming is uſed.

Of common grounds of varniſh, which are to be painted upon.

Where wood or leather is to be japanned and no priming is uſed, the beſt preparation is to lay two or three coats of coarſe varniſh compoſed in the following manner.

"Take of rectified ſpirit of wine one pint, "and of coarſe ſeed-lac and reſin each two "ounces. Diſſolve the ſeed-lac and reſin "in the ſpirit, and then ſtrain off the var-"niſh."

This varniſh, as well as all others formed of ſpirit of wine, muſt be laid on in a warm place; and, if it can be conveniently managed, the piece of work to be varniſhed ſhould be made warm likewiſe; and, for the ſame reaſon, all dampneſs ſhould be avoided; for either cold or moiſture chill this kind of varniſh, and prevent its taking proper hold of the ſubſtance on which it is laid.

When the work is ſo prepared, or by the priming with the compoſition of ſize and whiting above deſcribed, the proper japan ground muſt be laid on, which is much the beſt formed of ſhell-lac varniſh, and the colour deſired; if white be not in queſtion, which demands a peculiar treatment, as I ſhall below explain, or great brightneſs be not required, when alſo other means muſt be purſued. The compoſition of the ſhell-lac varniſh, with the reaſons why it is preferable to all other kinds as a vehicle for colours, I have before given, p. 191, and therefore need not repeat them here; though the advantage of this method over all others, where great brightneſs is not demanded, and the durableneſs is of conſequence, can ſcarcely be too much urged.

The colours uſed with the ſhell-lac varniſh, may be any pigments whatever which give the teint of the ground deſired, and they may be mixed together to form browns or any compound colours; but, with reſpect to ſuch as require peculiar methods for the producing them of the firſt degree of brightneſs, I ſhall particularize them below.

The colours for grounds may otherwiſe be mixed with the white varniſhes formed in oil of turpentine, of which the preparation is given, p. 193, 229, and 230; but theſe varniſhes have no advantages over the ſhell-lac, but in their whiteneſs, that preſerves the brightneſs of the colours, and they are at the ſame time greatly inferior in hardneſs to it.

As metals never require to be undercoated with whiting, they may be treated in the ſame manner as wood or leather when the undercoat is omitted, except in the inſtances particularly ſpoken of below.

Of white japan grounds.

The forming a ground perfectly white, and of the firſt degree of hardneſs, remains hitherto a deſideratum, or matter ſought for, in the art of japanning, as there are no ſubſtances which can be diſſolved ſo as to form a very hard varniſh, but what have too much colour not to deprave the whiteneſs, when laid on of a due thickneſs over the work, except ſome very late diſcoveries not hitherto brought into practice.

The neareſt approach, however, to a perfect white varniſh, by means already known to the public, is made by the following compoſition.

" Take flake white, or white lead, waſhed " over and ground up with a ſixth of its " weight of ſtarch, and then dried, and temper it properly for ſpreading with the maſtic " varniſh prepared as in p. 193, or compound " them with the gum animi, according to the " directions given in the ſame page." Lay theſe on the body to be japanned, prepared either with or without the undercoat of whiting, in the manner as above ordered, and then varniſh over it with five or ſix coats of the following varniſh.

" Provide any quantity of the beſt ſeed-" lac, and pick out of it all the cleareſt and " whiteſt grains, reſerving the more colour-" ed and fouler parts for the coarſer varniſhes

“ ſuch as that above-mentioned for priming
“ or preparing wood or leather. Take of this
“ picked ſeed-lac two ounces, and of gum ani-
“ mi three ounces, and diſſolve them, being
“ previouſly reduced to a groſs powder, in
“ about a quart of ſpirit of wine, and ſtrain
“ off the clear varniſh.”

The ſeed-lac will yet give a ſlight tinge to this compoſition, but cannot be omitted where the varniſh is wanted to be hard; though, where a ſofter will anſwer the end, the proportion may be diminiſhed, and a little crude turpentine added to the gum animi, to take off the brittleneſs.

A very good varniſh, free entirely from all brittleneſs, may be formed by diſſolving as much gum animi as the oil will take, in old nut or poppy oil, which muſt be made to boil gently when the gum is put into it. The ground of white colour itſelf may be laid on in this varniſh, and then a coat or two of it may be put over the ground, but it muſt be well diluted with oil of turpentine when it is uſed. This, though free from brittleneſs, is, nevertheleſs, liable to ſuffer by being indented or bruiſed by any ſlight ſtrokes, and it will not well bear any poliſh, but may be brought to a very ſmooth ſurface without, if it be judiciouſly managed in the laying it on. It is likewiſe ſomewhat tedious in drying, and will require ſome time where ſeveral coats are laid on, as the laſt ought not to contain much oil of turpentine. It muſt be obſerved, likewiſe, that the gum reſin, ſuch as the animi, copal, &c. can never be diſſolved in ſubſtantial oils by the medium of heat, without a conſiderable change in the colour of the oils, by the degree of heat neceſſary to produce the ſolution. A method of diſſolving gum copal in oil of turpentine is however now diſcovered by a gentleman of great abilities in chymiſtry, and he has alſo a method of diſſolving amber in the ſame menſtruum, ſo that we may hope ſoon to ſee the art of japanning carried to a conſummate degree of perfection, when the public are put in poſſeſſion of theſe moſt important inventions, or the fruits of them.

Of blue japan grounds.

Blue japan grounds may be formed of bright Pruſſian blue, or of verditer glazed over by Pruſſian blue, or of ſmalt. The colour may be beſt mixed with ſhell-lac varniſh, and brought to a poliſhing ſtate by five or ſix coats of varniſh of ſeed-lac; but the varniſh, nevertheleſs, will ſomewhat injure the colour, by giving to a true blue a caſt of green, and fouling in ſome degree a warm blue by the yellow it contains. Where, therefore, a bright blue is required, and a leſs degree of hardneſs can be diſpenſed with, the method before directed, in the caſe of white grounds, muſt be purſued.

Of red japan grounds.

For a ſcarlet japan ground vermilion may be uſed, but the vermilion alone has a glaring effect, that renders it much leſs beautiful than the crimſon produced by glazing it over with carmine or fine lake, or even with roſe pink, which has a very good effect uſed for this purpoſe. For a very bright crimſon, nevertheleſs, inſtead of glazing with carmine, the Indian lake, known in the ſhops by the name of *ſafflower*, ſhould be uſed, diſſolved in the ſpirit of which the varniſh is compounded (which it readily admits of when good); but in this caſe, inſtead of glazing with the ſhell-lac varniſh, the upper or poliſhing coats need only be uſed, as they will equally receive and convey the tinge of the Indian lake, which may be actually diſſolved by ſpirit of wine, and this will be found a much cheaper method than the uſing carmine. If, nevertheleſs, the higheſt degree of brightneſs be required, the white varniſhes muſt be uſed.

It is at preſent, however, very difficult to obtain this kind of lake, for it does not appear that more than one conſiderable quantity was ever brought over and put into the hands of colourmen, and this being now expended, they have not the means of a freſh ſupply; it, however, may be eaſily had from the ſame place whence the former quantity was procured, by any perſons who go thither in the Eaſt-India Company's ſhips.

Of yellow japan grounds.

For bright yellow grounds, King's yellow, or turpeth mineral, ſhould be employed, either alone or mixed with fine Dutch pink. The effect may be ſtill more heightened by diſſolving powdered turmeric root in the ſpirit of wine, of which the upper or poliſhing coat is made, which ſpirit of wine muſt be ſtrained from off the dregs, before the ſeed-lac be added to it to form the varniſh.

The ſeed-lac varniſh is not equally injurious here, and with greens, as in the caſe of other colours, becauſe, being only tinged with a reddiſh yellow, it is little more than an addition to the force of the colours.

Yellow grounds may be likewiſe formed of the Dutch pink only, which, when good, will not be wanting in brightneſs, though extremely cheap,

Of green japan grounds.

Green grounds may be produced by mixing King's yellow and bright Pruſſian blue, or rather turpeth mineral and Pruſſian blue. A cheap, but fouler kind, may be had from verdigriſe, with a little of the above-mentioned yellows, or Dutch pink. But where a very bright green is wanted, the cryſtals of verdi-

grife,

griſe, (called *diſtilled verdigriſe*) ſhould be employed, and, to heighten the effect, they ſhould be laid on a ground of leaf gold, which renders the colour extremely brilliant and pleaſing.

They may any of them be uſed ſucceſsfully with good ſeed-lac varniſh, for the reaſon before given, but will be ſtill brighter with the white varniſh.

Of orange-coloured japan grounds.

Orange-coloured japan grounds may be formed by mixing vermilion, or red lead, with King's yellow, or Dutch pink, or the orange lake, prepared as directed in p. 119, or red orpiment will make a brighter orange ground than can be produced by any mixture.

Of purple japan grounds.

Purple japan grounds may be produced by the mixture of lake and Pruſſian blue, or a fouler kind by vermilion and Pruſſian blue. They may be treated as the reſt with reſpect to the varniſh.

Of black japan grounds to be produced without heat.

Black grounds may be formed by either ivory-black, or lamp-black, but the former is preferable where it is perfectly good.

Theſe may be always laid on with the ſhell-lac varniſh, and have their upper or poliſhing coats of common ſeed-lac varniſh, as the tinge or foulneſs of the varniſh can be here no injury.

Of common black japan grounds on iron or copper, produced by means of heat.

For forming the common black japan grounds by means of heat, the piece of work to be japanned muſt be painted over with drying oil, and when it is of a moderate dryneſs muſt be put into a ſtove of ſuch degree of heat as will change the oil black, without burning it ſo as to deſtroy or weaken its tenacity. The ſtove ſhould not be too hot when the work is put into it, nor the heat increaſed too faſt, either of which errors would make it bliſter; but the ſlower the heat is augmented, and the longer it is continued, provided it be reſtrained within the due degree, the harder will be the coat of japan. This kind of varniſh requires no poliſh, having received, when properly managed, a ſufficient one from the heat.

Of the fine tortoiſe-ſhell japan ground produced by means of heat.

The beſt kind of tortoiſe-ſhell ground produced by heat is not leſs valuable for its great hardneſs, and enduring to be made hotter than boiling water without damage, than for its beautiful appearance. It is to be made by means of a varniſh prepared in the following manner.

"Take of good linſeed oil one gallon, and "of umbre half a pound. Boil them toge- "ther till the oil become very brown and "thick; ſtrain it then through a coarſe cloth, "and ſet it again to boil; in which ſtate it "muſt be continued till it acquire a pitchy "conſiſtence, when it will be fit for uſe."

Having prepared thus the varniſh, clean well the iron or copper-plate, or other piece which is to be japanned, and then lay vermilion tempered with ſhell-lac varniſh, or with drying oil diluted with oil of turpentine, very thinly on the places intended to imitate the more tranſparent parts of the tortoiſe-ſhell. When the vermilion is dry, bruſh over the whole with the black varniſh, tempered to a due conſiſtence with oil of turpentine; and when it is ſet and firm, put the work into a ſtove, where it may undergo a very ſtrong heat, and muſt be continued a conſiderable time, if even three weeks or a month, it will be the better.

This was given amongſt other recipes by Knuckel, but appears to have been neglected till it was revived with great ſucceſs in the Birmingham manufactures, where it was not only the ground of ſnuff-boxes, dreſſing-boxes, and other ſuch leſſer pieces, but of thoſe beautiful tea-waiters which have been ſo juſtly eſteemed and admired in ſeveral parts of Europe where they have been ſent. This ground may be decorated with painting and gilding in the ſame manner as any other varniſhed ſurface, which had beſt be done after the ground has been duly hardened by the hot ſtove; but it is well to give a ſecond annealing with a more gentle heat after it is finiſhed.

SECT. III.

Of painting japan work.

JAPAN work ought properly to be painted with colours in varniſh. The methods of this kind of painting I have before given under the article of painting in varniſh, in p. 190, and the following. But in order for the greater diſpatch, and, in ſome very nice works in ſmall, for the freer uſe of the pencil, the colours are now moſt frequently tempered in oil, which ſhould previouſly have a fourth part of its weight of gum animi diſſolved in it; or, in default of that, of the gums ſandarac or maſtic, as I have likewiſe before intimated. When the oil is thus uſed, it ſhould be well diluted with ſpirit of turpentine, that the colours may be laid more evenly and thin, by which means fewer of the poliſhing or upper coats of varniſh become neceſſary.

In ſome inſtances, water colours, as I before mentioned, are laid on grounds of gold, in the manner of other paintings, and are beſt, when ſo uſed, in their proper appearance, without any varniſh over them, and they are alſo ſometimes ſo managed as to have the effect of emboſſed work. The colours employed in this way, for painting, are (as I before intimated) beſt prepared by means of iſinglaſs ſize corrected with honey or ſugar-candy. The body of which the emboſſed work is raiſed, need not, however, be tinged with the exterior colour, but may be beſt formed of very ſtrong gum water, thickened to a proper conſiſtence by bole armoniac and whiting in equal parts; which being laid on in the proper figure, and repaired when dry, may be then painted with the proper colours tempered in the iſinglaſs ſize, or in the general manner with ſhell-lac varniſh.

SECT. IV.

Of varniſhing japan work.

THE laſt and finiſhing part of japanning lies in the laying on and poliſhing the outer coats of varniſh, which are neceſſary, as well in the pieces that have only one ſimple ground of colour, as with thoſe that are painted. This is in general beſt done with common ſeed-lac varniſh, except in the inſtances, and on thoſe occaſions, where I have already ſhewn other methods to be more expedient; and the ſame reaſons, which decide as to the fitneſs or impropriety of the varniſhes, with reſpect to the colours of the ground, hold equally well with regard to thoſe of the painting; for where brightneſs is the moſt material point, and a tinge of yellow will injure it, ſeed-lac muſt give way to the whiter gums; but where hardneſs, and a greater tenacity, are moſt eſſential, it muſt be adhered to; and where both are ſo neceſſary that it is proper one ſhould give way to the other, in a certain degree reciprocally, a mixed varniſh muſt be adopted.

This mixed varniſh, as I before obſerved, ſhould be made of the picked ſeed-lac, as directed in p. 487. The common ſeed-lac varniſh, which is the moſt uſeful preparation of the kind hitherto invented, may be thus made.

"Take of ſeed-lac three ounces, and put "it into water to free it from the ſticks and "filth that frequently are intermixed with it, "and which muſt be done by ſtirring it about, "and then pouring off the water and adding "freſh quantities, in order to repeat the opera- "tions till it be free from all impurities, as "it very effectually may be by this means. "Dry it then and powder it groſsly, and "put it, with a pint of rectified ſpirit of wine, "into a bottle, of which it will not fill above "two-thirds. Shake the mixture well to-

" gether, and place the bottle in a gentle " heat, till the ſeed appear to be diſſolved, the " ſhaking being in the mean-time repeated as " often as may be convenient; and then pour " off all which can be obtained clear by that " method, and ſtrain the remainder through " a coarſe cloth. The varniſh thus prepared, " muſt be kept for uſe in a bottle well ſtop- " ed."

When the ſpirit of wine is very ſtrong, it will diſſolve a greater proportion of the ſeed-lac; but this will ſaturate the common, which is ſeldom of a ſtrength ſufficient for making varniſhes in perfection. As the chilling, which is the moſt inconvenient accident attending thoſe of this kind, is prevented, or produced more frequently, according to the ſtrength of the ſpirit, I will take this opportunity of ſhewing a method by which weaker rectified ſpirits may with great eaſe, at any time, be freed from the phlegm, and rendered of the firſt degree of ſtrength.

" Take a pint of the common rectified " ſpirit of wine, and put it into a bottle, of " which it will not fill above three parts. " Add to it half an ounce of pearl-aſhes, ſalt " of tartar, or any other alkaline ſalt, heated " red hot, and powdered, as well as it can be, " without much loſs of its heat. Shake the " mixture frequently for the ſpace of half an " hour; before which time, a great part of " the phlegm will be ſeparated from the " ſpirit, and will appear, together with the

" undiſſolved part of the ſalts in the bottom " of the bottle. Let the ſpirit then be poured " off, or freed from the phlegm and ſalts by " means of a *tritorium*, or ſeparating funnel, " and let half an ounce of the pearl-aſhes, " heated and powdered as before, be added to " it, and the ſame treatment repeated. This " may be done a third time, if the quantity " of phlegm, ſeparated by the addition of the " pearl-aſhes, appear conſiderable. An ounce " of alum reduced to powder and made hot, " but not burnt, muſt then be put into the " ſpirit, and ſuffered to remain ſome hours, " the bottle being frequently ſhaken; after " which, the ſpirit being poured off from it, " will be fit for uſe."

The addition of the alum is neceſſary to neutralize the remains of the alkaline ſalt, or pearl-aſhes, which would otherwiſe greatly deprave the ſpirit with reſpect to varniſhes and lacquers, where vegetable colours are concerned, and muſt conſequently render another diſtillation neceſſary.

The manner of uſing the ſeed-lac or white varniſhes is the ſame, except with regard to the ſubſtance uſed in poliſhing; which, where a pure white, or great clearneſs of other colours is in queſtion, ſhould be itſelf white; whereas the browner ſorts of poliſhing duſt, as being cheaper, and doing their buſineſs with greater diſpatch, may be uſed in other caſes. The pieces of work to be varniſhed ſhould be placed near a fire, or in a room

where

where there is a ſtove, and made perfectly dry, and then the varniſh may be rubbed over them by the proper bruſhes made for that purpoſe, beginning in the middle, and paſſing the bruſh to one end, and then, with another ſtroke from the middle, paſſing it to the other. But no part ſhould be croſſed or twice paſſed over, in forming one coat, where it can poſſibly be avoided. When one coat is dry, another muſt be laid over it, and this muſt be continued at leaſt five or ſix times, or more, if, on trial, there be not a ſufficient thickneſs of varniſh to bear the poliſh, without laying bare the painting or the ground colour underneath.

When a ſufficient number of coats is thus laid on, the work is fit to be poliſhed, which muſt be done, in common caſes, by rubbing it with a rag dipped in tripoli (commonly called *rotten ſtone*) finely powdered. But towards the end of the rubbing, a little oil of any kind ſhould be uſed along with the powder; and when the work appears ſufficiently bright and gloſſy, it ſhould be well rubbed with the oil alone, to clean it from the powder, and give it a ſtill brighter luſtre.

In the caſe of white grounds, inſtead of the tripoli, fine putty, or whiting, muſt be uſed, both which ſhould be waſhed over to prevent the danger of damaging the work from any ſand, or other gritty matter that may happen to be commixed with them.

It is a great improvement of all kinds of japan work to harden the varniſh by means of heat, which, in every degree where it can be applied ſhort, of what would burn to calcine the matter, tends to give it a more firm and ſtrong texture. Where metals form the body, therefore, a very hot ſtove may be uſed, and the pieces of work may be continued in it a conſiderable time, eſpecially if the heat be gradually increaſed; but where wood is in queſtion, heat muſt be ſparingly uſed, as it would otherwiſe warp or ſhrink the body ſo as to injure the general figure.

SECT. V.

Of gilding japan work.

ALL the methods of gilding, which are applicable to the ornamenting japan work, having been before taught under the article of gilding, it is needleſs to repeat them here. I ſhall therefore only again obſerve, that in gilding with gold ſize (which is almoſt the only method now practiſed in japan work) where it is deſired to have the gold not ſhine, or approach in the leaſt towards the burniſhing ſtate, the ſize ſhould be uſed either with oil of turpentine only, or with a very little fat oil; but where a greater luſtre and appearance of poliſh are wanting without the trouble of burniſhing, and the preparation neceſſary for it, fat oil alone, or mixed with a little gold ſize, ſhould be uſed, and the ſame proportionable effect will be produced from a mean proportion of them.

CHAP. V.

Of lacquering.

LACQUERING is the laying either coloured or tranſparent varniſhes on metals, in order to produce the appearance of a different colour in the metal, or to preſerve it from ruſt and the injuries of the weather.

Lacquering is therefore much of the ſame nature with japanning, both with regard to the principles and practice, except that no opake colours, but tranſparent tinges alone, are to be employed.

The occaſions on which lacquering is now in general uſed are three; where braſs is to be made, to have the appearance of being gilt; where tin is wanted, to have the reſemblance of yellow metals; and where braſs or copper locks, nails, or other ſuch matters as are to be defended from the corroſion of the air or moiſture. There was indeed formerly another very frequent application of lacquering, which was colouring frames of pictures, &c. previouſly ſilvered in order to give them the effect of gilding, but this is now greatly diſuſed. Theſe various intentions of lacquering require different compoſitions for the effectuating each kind, and as there is a multiplicity of ingredients which may be conducive to each purpoſe, a proportionable number of recipes have been deviſed and introduced into practice, eſpecially for the lacquering braſs work to imitate gilding, which is a conſiderable object in this kind of art, and has been improved to the greateſt degree of perfection. I ſhall, however, only give one or two recipes for each, as they are all which are neceſſary, the others being either made too complex by ingredients not eſſential to the intention, or too coſtly by the uſe of ſuch as are expenſive, or inferior in goodneſs, from the improper choice or proportion of the component ſubſtances.

The principal body or matter of all good lacquers uſed at preſent is ſeed-lac; but, for coarſer uſes, reſin or turpentine is added, in order to make the lacquer cheaper than if the ſeed-lac, which is a much dearer article, be uſed alone. Spirit of wine is alſo conſequently the fluid or menſtruum of which lacquers are formed, as the etherial oils will not diſſolve the ſeed-lac, and it is proper that the ſpirit ſhould be highly rectified for this purpoſe. As it is ſeldom practicable, nevertheleſs, to procure ſuch ſpirits from the ſhops, it will be found very advantageous to uſe the method above given for dephlegmating it by alkaline ſalts; but the uſe of the alum, directed in that proceſs, muſt not be forgotten on this occaſion, as the effect of the alkaline ſalt would otherwiſe be the turning the metal of a purpliſh inſtead of a golden colour, by laying on the lacquer.

The following are excellent compoſitions for braſs work which is to reſemble gilding.

"Take of turmeric ground, as it may be
" had at the dry-ſalters, one ounce, and of
" ſaffron and Spaniſh annatto each two drams.
" Put them into a proper bottle with a pint
" of highly-rectified ſpirit of wine, and place
" them in a moderate heat, if convenient,
" often ſhaking them for ſeveral days. A
" very ſtrong yellow tincture will then be ob-
" tained, which muſt be ſtrained off from the
" dregs through a coarſe linen cloth, and
" then, being put back into the bottle, three
" ounces of good ſeed-lac, powdered groſsly,
" muſt be added, and the mixture placed
" again in a moderate heat, and ſhaken till
" the ſeed-lac be diſſolved, or at leaſt ſuch
" part of it as may. The lacquer muſt then
" be ſtrained as before, and will be fit for
" uſe, but muſt be kept in a bottle carefully
" ſtopped."

Where it is deſired to have the lacquer warmer or redder than this compoſition may prove, the proportion of the annatto muſt be increaſed; and where it is wanted cooler, or nearer a true yellow, it muſt be diminiſhed.

The above, properly managed, is an extreme good lacquer, and of moderate price; but the following, which is cheaper, and may be made where the Spaniſh annatto cannot be procured good, is not greatly inferior to it.

"Take of turmeric root ground one ounce, "of the beſt dragon's blood half a dram. Put "them to a pint of ſpirit of wine, and proceed "as with the above."

By diminiſhing the proportion of the dragon's blood, the varniſh may be rendered of a redder or truer yellow caſt.

Saffron is ſometimes uſed to form the body of colour in this kind of lacquer, inſtead of the turmeric, but though it makes a warmer yellow, yet the dearneſs of it, and the advantage which turmeric has in forming a much ſtronger tinge in ſpirit of wine, not only than the ſaffron, but than any other vegetable matter hitherto known, gives it the preference. Though, being a true yellow, and conſequently not ſufficiently warm to overcome the greeniſh caſt of braſs, it requires the addition of ſome orange-coloured tinge to make a perfect lacquer for this purpoſe.

Aloes and gamboge are alſo ſometimes uſed in lacquers for braſs; but the aloes is not neceſſary where turmeric or ſaffron are uſed; and the gamboge, though a very ſtrong milky yellow in water, affords only a very weak tinge in ſpirit of wine.

The varniſh for tin may be made as follows.

"Take of turmeric-root one ounce, of dragon's blood two drams, and of ſpirit of wine one pint. Proceed as in the former."

This may, like the former, have the red or yellow rendered more prevalent by the increaſing or diminiſhing the proportion of the dragon's blood. Where a coarſer or cheaper kind is wanted, the quantity of ſeed-lac may be abated, and the deficiency thence ariſing ſupplied by the ſame proportion of reſin.

The lacquer for locks, nails, &c. where little or no colour is deſired, may either be ſeed-lac varniſh alone, as prepared above, or with a little dragon's blood, or a compound varniſh of equal parts of ſeed-lac and reſin, with or without the dragon's blood.

The lacquer for picture frames, &c. where the ground is ſilver, and the appearance of gilding is to be produced, may be the compoſition before given, p. 463, for gilding leather, the principle being exactly the ſame in this caſe and that.

The manner of laying on the lacquer is as follows.

Firſt let the pieces of work to be lacquered be made thoroughly clean, which, if they be new founded, muſt be done by means of *aqua fortis*. Being ready, they muſt be heated by a ſmall charcoal fire in a proper veſſel, or any way that may be moſt convenient; the degree muſt not be greater than will admit of their being taken hold of without burning the hand. The lacquer muſt then be laid on by a proper laid on by a proper bruſh in the manner of other varniſhes, and the pieces immediately ſet again in the ſame warm ſituation. After the lacquer is thoroughly dry and firm, the ſame operation muſt be renewed again for four or five times, or till the work appear of the colour and brightneſs intended. For very fine work ſome uſe a little proportion of ſeed-lac, which occaſions the lacquer to lie evener on the metal; but, in this caſe, a greater number of coats are required, which multiplies the proportion of labour, though, where the price of the work will allow for ſuch additional trouble, it will be the more perfect for it.

The lacquering tin may be performed in the ſame manner as is here directed for braſs, but, being for coarſer purpoſes, leſs nicety is obſerved, and fewer coats (or perhaps one only) are made to ſuffice, as the lacquer is compounded very red that the tinge may have the ſtronger effect.

Locks, nails, &c. where lacquer is only uſed in a definitive view to keep them from corroding, and not for the improvement of the colour, may be treated in the ſame manner, but one or two coats are generally thought ſufficient; though, where any regard is had to the wear, the coats of lacquer or varniſh ſhould always be of a due thickneſs when they are to be expoſed to the air, otherwiſe the firſt moiſt weather makes them chill and look grey and miſty, in ſuch manner, that they are rather injurious than beneficial to the work they are laid upon.

The lacquering picture frames, &c. where the ground is leaf-ſilver, may be performed in the ſame manner as was before directed in the caſe of gilding leather, the circumſtances being nearly the ſame, except with relation to the texture of the ſubject, to ſuit which, the different manner of treatment may be eaſily adapted; but the lacquer, as was before obſerved, may be the ſame.

CHAP. VI.

Of ſtaining wood, ivory, bone, horn, alabaſter, marble, and other ſtones, of various colours.

SECT. I. *Of ſtaining wood.*

Of ſtaining wood yellow.

TAKE any white wood, and bruſh it over ſeveral times with the tincture of turmeric-root, made by putting an ounce of the turmeric, ground to powder, to a pint of ſpirit, and, after they have ſtood ſome days, ſtraining off the tincture. If the yellow colour be deſired to have a redder caſt, a little dragon's gon's blood muſt be added, in the proportion that will produce the teint required.

A cheaper, but leſs ſtrong and bright yellow, may be given to wood, by rubbing it over ſeveral times with the tincture of the French berries, prepared as in p. 109, and made boiling hot. After the wood is again dry, it ſhould be bruſhed over with a weak alum-water uſed cold.

Leſſer pieces of wood, inſtead of being bruſhed over with them, may be ſoaked in the decoctions of tinctures.

Wood may be alſo ſtained yellow by means of *aqua fortis*, which will ſometimes produce a very beautiful yellow colour, but at other times a browner. The wood ſhould be warm when the *aqua fortis* is laid on, and be held to the fire immediately afterwards, and care muſt be taken, that either the *aqua fortis* be not too ſtrong, or that it be ſparingly uſed, otherwiſe a brown, ſometimes even a blackiſh colour may be the reſult.

In order to render any of theſe ſtains more beautiful and durable, the wood ſhould be ruſhed after it is coloured, and then varniſhed by the ſeed-lac varniſh; or, when deſired to be very ſtrong, and to take a high poliſh, with three or four coats of ſhell-lac varniſh.

Of ſtaining wood red.

For a bright red ſtain for wood, make a ſtrong infuſion of Braſil in ſtale urine, or water

ter impregnated with pearl-aſhes, in the proportion of an ounce to a gallon, to a gallon of either of which the proportion of Braſil wood muſt be a pound, which being put to them, they muſt ſtand together two or three days, often ſtirring the mixture. With this infuſion ſtrained, and made boiling hot, bruſh over the wood to be ſtained till it appear ſtrongly coloured; then, while yet wet, bruſh it over with alum-water made in the proportion of two ounces of alum to a quart of water.

For a leſs bright red diſſolve an ounce of dragon's blood to a pint of ſpirit of wine, and bruſh over the wood with the tincture till the ſtain appear to be as ſtrong as is deſired; but this is, in fact, rather lacquering than ſtaining.

For a pink or roſe red, add to a gallon of the above infuſion of Braſil wood two additional ounces of the pearl-aſhes, and uſe it as was before directed; but it is neceſſary, in this caſe, to bruſh the wood over often with the alum-water. By increaſing the proportion of pearl-aſhes the red may be rendered yet paler; but it is proper, when more than this quantity is added, to make the alum-water ſtronger.

Theſe reds, when it is neceſſary, may be varniſhed as the yellows.

Of ſtaining wood blue.

Wood may be ſtained blue by means either of copper or indigo, but the firſt will afford a brighter colour, and is more generally practicable than the latter, becauſe the indigo can be uſed only in that ſtate to which it is brought by the manner of preparation uſed by the dyers, of whom indeed it muſt be had, as it cannot be properly ſo prepared but in large quantities, and with a particular apparatus. The method of ſtaining blue with the copper is therefore as follows.

" Take a ſolution of copper, made accord-
" ing to the directions given in p. 92, and
" bruſh it, while hot, ſeveral times over the
" wood; then make a ſolution of pearl-aſhes,
" in the proportion of two ounces to a pint of
" water, and bruſh it hot over the wood, ſtain-
" ed with the ſolution of copper, till it be of
" a perfectly blue colour."

Wood ſtained green as above by verdigriſe, may likewiſe be made blue, by uſing the ſolution of the pearl-aſhes in the ſame manner.

When indigo is uſed for ſtaining wood blue, it muſt be managed thus.

" Take indigo prepared with ſoap-lees, as
" when uefd by the dyers, and bruſh the wood
" with it boiling hot. Prepare then a ſolution
" of white tartar, or cream of tartar, which is
" to be made by boiling three ounces of the
" tartar, or cream, in a quart of water, and with
" this ſolution, uſed copiouſly, bruſh over the
" wood before the moiſture of the tincture of
" indigo be quite dried out of it."

Theſe blues may be ruſhed and varniſhed as the reds, where there is occaſion.

Of ſtaining wood a mahogany colour.

Mahogany colour is the moſt uſeful of any ſtain for wood (eſpecially ſince the fineering with different colours is out of faſhion) as it is much practiſed at preſent for chairs and other furniture made in imitation of mahogany, which, when well managed, may be brought to have a very near reſemblance.

This ſtain may be of different hues, as the natural wood varies greatly, being of all the intermediate teints betwixt the red brown, and purple brown, according to the age, or ſometimes the original nature of different pieces.

For the light red brown, uſe a decoction of madder and fuſtic wood ground in water; the proportion may be half a pound of madder, and a quarter of a pound of fuſtic to a gallon; or, in default of fuſtic, an ounce of the yellow berries may be uſed. This muſt be bruſhed over the wood to be ſtained, while boiling hot, till the due colour be obtained, and, if the wood be kindly grained, it will have greatly the appearance of new mahogany.

The ſame effect nearly may be produced by the tincture of dragon's blood and turmeric-root in ſpirit of wine, by increaſing or diminiſhing the proportion of each of which ingredients, the brown ſtain may be varied to a more red or yellow caſt at pleaſure. This ſucceeds better upon wood, which has already ſome tinge of brown, than upon whiter.

For the dark mahogany take the infuſion of madder made as above, except the exchanging the fuſtic for two ounces of logwood, and when the wood to be plained has been ſeveral times bruſhed over, and is again dry, it muſt be ſlightly bruſhed over with water in which pearl-aſhes have been diſſolved, in the proportion of about a quarter of an ounce to a quart.

Any ſtains of the intermediate colours may be made by mixing theſe ingredients, or varying the proportion of them.

Where theſe ſtains are uſed for better kind of work, the wood ſhould be afterwards varniſhed with three or four coats of ſeed-lac varniſh, but for coarſe work, the varniſh of reſin and ſeed-lac may be employed, or they may be only well rubbed over with drying oil.

Of ſtaining wood green.

Diſſolve verdigriſe in vinegar, or cryſtals of verdigriſe in water, and, with the hot ſolution, bruſh over the wood till it be duly ſtained.

This may be ruſhed and varniſhed as the above.

Of ſtaining wood purple.

Bruſh the wood to be ſtained ſeveral times with a ſtrong decoction of logwood and Braſil, made in the proportion of one pound of the logwood, and a quarter of a pound of the Braſil to a gallon of water, and boiled for an hour or more. When the wood has been bruſhed over till there be a ſufficient body of colour, let it dry, and then be ſlightly paſſed over by a ſolution of one dram of pearl-aſhes in a quart of water. This ſolution muſt be carefully uſed, as it will gradually change the colour from a brown red, which it will be originally found to be, to a dark blue purple, and therefore its effect muſt be reſtrained to the due point for producing the colour deſired.

This may be varniſhed as the reſt.

Of ſtaining wood black.

Bruſh the wood ſeveral times with the hot decoction of logwood made as above, but without the Braſil; then having prepared an infuſion of galls, by putting a quarter of a pound of powdered galls to two quarts of water, and ſetting them in the ſun-ſhine, or any other gentle heat, for three or four days, bruſh the wood three or four times over with it, and then paſs over it again, while yet wet, with a ſolution of green vitriol in water, in the proportion of two ounces to a quart.

The above is the cheapeſt method; but a very fine black may be produced by bruſhing the wood ſeveral times over with a ſolution of copper in *aqua fortis*, and afterwards with the decoction of logwood, which muſt be repeated till the colour be of ſufficient force, and the greenneſs, produced by the ſolution of the copper, wholly overcome.

Theſe blacks may be varniſhed as the other colours.

Where the ſtains are deſired to be very ſtrong, as in the caſe of wood intended to be uſed for fineering, it is in general neceſſary they ſhould be ſoaked, and not bruſhed; to render which the more practicable, the wood may be previouſly ſlit, or ſawed, into pieces of a proper thickneſs for inlaying.

It is to be underſtood alſo, that when the wood is above ordered to be bruſhed ſeveral times over with the tinging ſubſtances, it ſhould be ſuffered to dry betwixt each time.

SECT. II.

Of ſtaining ivory, bone, or horn.

Of ſtaining ivory, bone, or horn, yellow.

BOIL them firſt in a ſolution of alum, in the proportion of one pound to two quarts of water, and then prepare a tincture of the French berries, by boiling half a pound of the berries, pounded, in a gallon of water with a quarter of a pound of pearl-aſhes. After this tincture has boiled about an hour, put the ivory, &c. previouſly boiled in the alum wa-

ter

ter into it, and let them remain there half an hour.

If turmeric-root be uſed inſtead of the French berries, a brighter yellow may be obtained, but the ivory, &c. muſt in that caſe be again dipped in alum water after it is taken out of the tincture, otherwiſe an orange colour, not a yellow, will be produced from the effect of the pearl-aſhes on the turmeric.

Of ſtaining ivory, bone, and horn, green.

They muſt be boiled in a ſolution of verdigriſe in vinegar, or of copper in *aqua fortis*, prepared as above directed, (a veſſel of glaſs or earthen-ware being employed for this purpoſe) till they be of the colour deſired.

Of ſtaining ivory, bone, and horn, red.

Take ſtrong lime water, prepared as for other purpoſes, and the raſpings of Braſil wood, in the proportion of half a pound to a gallon. Let them boil for an hour, and then put in the ivory, &c. prepared by boiling in alum water in the manner above directed for the yellow, and continue it there till it be ſufficiently coloured. If it be too crimſon, or verge toward the purple, it may be rendered more ſcarlet, by dipping again in the alum water.

Of ſtaining ivory, bone, and horn, blue.

Stain the ivory, &c. firſt green, according to the manner above directed, and then dip it in a ſolution of pearl-aſhes made ſtrong and boiling hot; but it muſt not be continued longer, nor dipped oftener, than is neceſſary to convert the green to blue.

The ivory, &c. may otherwiſe be boiled in the tincture of indigo prepared as by the dyers, and afterwards in the ſolution of tartar made as is directed for the ſtaining wood.

Of ſtaining ivory, bone, and horn, purple.

Treat them in the ſame manner as was directed for red, except that logwood muſt be ſubſtituted in the place of Braſil wood, and the uſe of the alum-water muſt be omitted wholly.

If a redder purple be wanted, a mixture of the logwood and Braſil muſt be employed, inſtead of the logwood alone. The proportion may be equal parts, or any leſs proportion of the Braſil, according to the colour deſired.

Of ſtaining horn in imitation of tortoiſe-ſhell.

The horn to be ſtained muſt be firſt preſſed into proper plates, or ſcales, or other flat form. The following mixture muſt then be prepared.

"Take of quick-lime two parts, and of li-
"tharge one, and temper them to the con-
"ſiſtence of a ſoft paſte with ſoap-lye."

Put this paſte over all the parts of the horn, except ſuch as are proper to be left tranſparent, in order to the greater reſemblance of the tortoiſe-ſhell. The horn muſt then remain thus covered with the paſte till it be thoroughly dry; when the paſte being bruſhed off, the horn will be found partly opake, and partly tranſparent, in the manner of tortoiſe-ſhell, and when put over a foil, of the kind of latten called aſſidue, will be ſcarcely diſtinguiſhable from it. It requires ſome degree of fancy, and judgment, to diſpoſe of the paſte in ſuch a manner as to form a variety of tranſparent parts of different magnitude and figure, to look like the effect of nature, and it will be an improvement to add ſemi-tranſparent parts. This may be done by mixing whiting with ſome of the paſte to weaken its operation in particular places, by which ſpots of a reddiſh brown will be produced, that if properly interſperſed, eſpecially on the edges of the dark parts, will greatly increaſe as well the beauty of the work, as its ſimilitude with the real tortoiſe-ſhell.

To ſtain ivory, bone, and horn black.

Proceed in the ſame manner as is above directed for wood.

SECT.

SECT. III.

Of ſtaining paper, or parchment, of various colours.

Of ſtaining paper, or parchment, yellow.

PAPER may be ſtained yellow by the tincture of French berries prepared as in p. 109; but a much more beautiful colour may be obtained by uſing the tincture of turmeric, formed by infuſing an ounce or more of the root, powdered in a pint of ſpirit of wine. This may be made to give any teint of yellow, from the lighteſt ſtraw to the full colour, called French yellow, and will be equal in brightneſs even to the beſt dyed ſilks. If yellow be wanted of a warmer or redder caſt, anatto, or dragon's blood, muſt be added to the tincture.

The beſt manner of uſing theſe, and the following tinctures, is to ſpread them even on the paper, or parchment, by means of a broad bruſh, in the manner of varniſhing.

Of ſtaining paper, or parchment, red.

Paper, or parchment, may be ſtained red, by treating it in the ſame manner as is directed for wood. p. 509, or by red ink. It may alſo be ſtained of a ſcarlet hue by the tincture of dragon's blood in ſpirit of wine, but this will not be bright.

A very fine crimſon ſtain may be given to paper by a tincture of the Indian lake before-mentioned, p. 67, which may be made by infuſing the lake ſome days in ſpirit of wine, and then pouring off the tincture from the dregs.

Of ſtaining paper, or parchment, green.

Paper, or parchment, may be ſtained green, by the ſolution of verdigriſe in vinegar, or by the cryſtals of verdigriſe diſſolved in water, as alſo by the ſolution of copper in *aqua fortis*, made by adding filings of copper gradually to the *aqua fortis* till no ebullition enſues; or ſpirit of ſalt may be uſed in the place of the *aqua fortis*.

Of ſtaining paper, or parchment, blue.

A blue colour may be given to paper, or parchment, by ſtaining it green by any of the above-mentioned methods, and treating it afterwards as is directed for the ſtaining wood blue, by the ſame means, or by indigo in the manner there explained likewiſe.

Of ſtaining paper, or parchment, orange.

Stain the paper, or parchment, firſt of a full yellow, by means of the tincture of turmeric, as above directed; then bruſh it over with a ſolution of fixed alkaline ſalt, made by diſſolving half an ounce of pearl-aſhes, or ſalt of tartar, in a quart of water, and filtering the ſolution.

Of ſtaining paper, or parchment, purple.

Paper, or parchment, may be ſtained purple by archal, or by the tincture of logwood, according to the method above directed for ſtaining wood. The juice of ripe privet berries expreſſed will likewiſe give a purple dye to paper or parchment.

SECT. IV.

Of ſtaining alabaſter, marble, and other ſtones, of various colours.

ALabaſter, marble, and other ſtones, may be ſtained of a yellow, red, green, blue, purple, black, or any of the compound colours, by the means above given for ſtaining wood. But it is better, when a ſtrong tinge is wanted, to pour the tincture, if made in water, boiling hot on the alabaſter, &c. ſpreading it equally on every part, then to bruſh it over only, though that may be ſufficient where a ſlighter dye will ſuffice. When tinctures in ſpirit of wine are uſed, they muſt not be heated, as the ſpirit would evaporate, and leave the tinging gums in an undiſſolved ſtate.

Where ſtones are not perfectly white, but partake of brownneſs or greyneſs, the colour produced by the tinges will be proportionably wanting in brightneſs; becauſe the natural colour of the ſtone is not hid or covered by theſe tinges, but combines with them; and, for the ſame reaſon, if the ſtone be of any of the pure colours, the reſult will be a compound of ſuch colour and that of the tinge.

INDEX.

A

ALABASTER, how to be ſtained of various colours 521

Antimony, as a white colour for enamel, 284:——as a yellow colour for enamel, 302:—*glaſs* of, how uſed in enamel painting, 303

Apparatus for making colours, 18:——for enamel painting, 266:——for gilding, 424

Arabic gum 165

Archal, or *Orchal*, 121

Argentum muſivium, how prepared, 472

Arſenic, how uſed in enamel, 285

Aſhes ultramarine, 79:——how uſed in enamel, 287

Aſphaltum, 129

Aurum Moſaicum, what, 441:——how prepared. 441

B.

Balneum mariæ, 28

Bellows for burning enamel in an open hearth, 273

Bice, 95

Binders in the formation of crayons, what, 188

Biſtre, 125

Black colours, 138:——*lamp*, 138:——*ivory*, 139:——*blue*, 141

Blue colours, 70:——*Pruſſian*, 82:——*de ſendres*, or ſanders blue, 90

Body in colours, what, 65:——in the compoſition of crayons, of what to be formed, 195

Boiler for making colours, 25

Bone, how to be ſtained of various colours, 515

Borax, as an enamel flux, 279

Bowl pewter, 27

Bowles's white glaſs, as an enamel ground, 334

Breaking colours, what, 4

Bricks, as a colour in enamel, 304

Brightneſs of *colours*, what, 44

Bronzing, what, and how to be performed, 476

Brown colours, 123:——*pink*, 123:——*ochre*, 127

Burning enamel, or glaſs, what, 265:——enamel grounds, particular in manner of, 355:——enamel paintings, 357:——paintings on glaſs, 263

Burniſhing, how performed in gilding 437

Butterflies, how to be preſerved, 420

Calcination,

C

Calcination, what, and how performed, 35

Calcined antimony, 285 :——*hartſhorn*, 134 :——*copper*, 259 :——*iron*, 255 :——*ſilver*, 259 :—*tin*, 281

Calking, what, 387 :——how performed, 396

Camera obſcura, its uſe in drawing, 394

Carmine, 57

Caſts from large ſubjects, 709 :—from ſmall animals or vegetables, 411 :—from metals or other ſmall ſubjects, 414

Ceruſe, or white lead, 132

Cryſtals of verdigriſe (commonly called diſtilled verdigriſe) 113

Cinnabar native, 48 :——how counterfeited by the factitious, 48

Claſſes of the colours, 8

Cleaning pictures, 236

Clear coating (vulgarly called clear coaling) what, 219

Cloths for oil painting, what, 217 :——how beſt prepared, 218

Coffins for burning enamel and painted glaſs, 276

Cologn or *Collen's earth*, 127

Colouring maps, prints, &c. 381

Colours, what, 1 :——kinds of, 3 :—*black*, 138 :——*blue*, 70 :——*brown*, 123 :——*green*, 112 :——*orange*, 119 :——*purple*, 120 :——*white*, 131 :——*yellow*, 97 :——compoſition with the proper vehicles, 173 :—proper to be uſed with oils, 173 :—proper to be uſed with water or in miniature painting, 178 :——proper to be uſed in diſtemper, or painting with ſize, 187 :——proper to be uſed in freſco painting, 180 :——proper to be uſed in varniſh, 189 :——for enamel, of what formed, 263 :——black, 353 :——blue, 340 :——brown, 352 :——green, 347 :——orange, 349 :——red, 336 :——purple, 351 :——white, 281 :——yellow, 344 :——for painting on glaſs by burning, 371 :——without burning, 379

Coolneſs in colours, what, 7

Copper, its uſe and preparation for forming colours in enamel, 295 :——powder of, 477 :——calcined, 296

Covering, as a quality in colours, what, 6

Crayons, general nature of, 195 :——white, 205 :——red, 206 :—blue, 209 :—yellow, 210 :—green, 211 :—orange, 213 :——purple, 213 :——brown, 214 :——black and grey, 215

Crocus Martis, or calcined iron, 300
Crucibles for enamel, 277
Cullenders for filtering, 28
Cuſhion for gilding, what, 424

D.

Deſigns, how to be more eaſily made, 385
Devices uſed in drawing, 385
Diſtemper painting, what, 187
Dryers, what, 145 :——particular kinds of, 158
Drying oil, what, and how prepared, 158
Dutch gold, 423 :——*pink*, 100

E.

Egg-ſhell white 138
Enamel painting, general nature of, 261 :——*grounds*, of what formed, 281 :——*compoſition* and *preparation* of, 330 :——how burnt, 335 :——*colours*, of what formed, 263 :——*black*, 353 :——*blue*, 340 :——*brown*, 352 :——*green*, 347 :——*orange*, 349 :——*red*, 336 :——*purple*, 351 :——*white*, 281 :——*yellow*, 344 :——how laid, and burnt, 361 :——inſtruments of, 266
Encauſtic painting, general nature of, 245 :——colours proper for, 253 :—how to be fixed, 257 :—ſtandard for ſhewing the difference of fixed and unfixed, 255 :——crayons, manner of painting with, 259 :——paſtils or crayons proper for, 259
Engliſh pink, 101
Evaporation, 40
Extract of liquorice, 130

F.

Fat oil, what, 143 :——how prepared, 426
Fattening of colours, what, 6 :——how produced, 14 :——of oils, what, 152
Filtration, how to be performed, 37
Filters, 28
Fire-lute, 14
Flake white, 131
Flints, as a body for enamel, 280
Fluxes in enamel painting, what, 278 :——ſubſtances uſed in compounding, 280 :—particular compoſition of, 326 :—for painting on glaſs, 367

Flying of colours, what, 4

Foulneſs of colours, what, 4

Freſco painting, what, 189

Furnaces for making colours, 14 :——for calcining Pruſſian blue, 23 :——for enamelling, 267 :——for ſubliming King's yellow, 21 :——for vermilion, 15

G.

Gall ſtones, 106

Gamboge, 103

Gilding in general, 421 :——kinds of, 422 :——in oil, 426 :—with burniſhed work, 331 :——japanners, 438 :——enamel or glaſs by burning, 374 :——without burning, 469 :——paper, vellum, and parchment, 444 :——leather, by general methods, 453 :——according to the manner of the leather-gilders, 454

Glair of eggs, as a varniſh for pictures, 226

Glaſs as a ground for painting with vitreous colours, or by burning, 265 :——how painted with vitreous colours, and burnt, 367 :——how gilt by burning, 374 :——how gilt without burning, 469 :——*of antimony*, as an enamel colour, 303 :——*of lead*, as an enamel flux, 326 :——*Venetian*, as a flux, 329 :——*common*, or *Bowles's white*, as an enamel ground, 334

Glazing with colours, what, 5

Gold, its uſe in enamel, 289 :——*purple* or precipitated of, 290 :——*leaf*, 422 :——*Dutch*, 423 :——*powder* proper for gilding glaſs or enamel, 376 :——proper for japanners gilding, 440 :——*ſhell*, what, 445 :——how prepared, 445 :——ſize for japanners gilding, 438 :——for burniſh gilding, 432

Green colours, 112 ——*Pruſſian*, 116 :——ſap, 115

Gounds for oil painting, 216 :——for water colours, 220 :——for painting in diſtemper, 222 :——for freſco painting, 223 :——for varniſh painting, 224 ——for encauſtic painting, 247 :——for enamel, of what formed, 281 :——compoſition and preparation of, 330 :——how laid on and burnt, 371 :——for japan work, 483

Gum Arabic, 165 :——*Senegal*, 166 :——*ſanderac*, 171 :——*maſtic*, 171

Gum water, how prepared, 180

H.

Hardneſs of enamel, and fluxes, what, 262

Hartſhorn, calcined or burnt, 134

Horn, how to be ſtained of various colours, 515

J. I.

Japanning, general nature of, 479

Japan work, grounds for, 483 :——white, 487 :——black, 493 :——blue, 489 :——red, 490 :——green, 491 :——oange, 492 :——purple, 492 :——tortoiſe-ſhell, 493 :——yellow, 491 ;——how painted, 465 ——how varniſhed, 496 :——how gilded, 501 :——how poliſhed, 501

Impreſſions, how to be taken from various ſubjects, 404

Indian ink, 142

Indian red, true, 120 :——common or factitious, 53

Indigo, 92

Inſtruments for making colours, 13 :——for enamelling, 266 :——for gilding, 424

Iron, its uſe in, and preparation for forming colours in enamel, 298 :——how to be caſt with a ſmall heat, 415

Iſinglaſs, 168 :——*ſize*, how prepared. 181

Juice, Spaniſh, 130

Ivory black, 139

Ivory, how to be ſtained of various colours, 515

K.

King's yellow 97

L.

Lac ſeed, 169 :——*ſhell*, 170

Lacmus, or *Litmus*, 95

Lake, *common*, 59 :——*beautiful*, prepared from Braſil wood, 64 :——*Chineſe* or *Indian*, 67 :——*roſe* or *roſe pink*, 68 :——*orange*, 119

Lamp black, 138

Lacquering, what, and how performed, 454

Lacquer for imitating gold, 463 :——for tin, 505 :——defending braſs work, 504

Lavender, *oil of*, as a ſecondary vehicle in enamel painting, 157

Lead, *red*, 49 :——*white*, 132 :——*ſugar of*, 162

Leaf-gold, qualities and kinds of, 422

Leather, how gilded, 453

Leaves, impreſſions of, 194 :——how to be preſerved for a long time, 419

Levigation, how to be performed, 41
Light pink, 102
Linſeed oil, 154
Liquorice, extract of, or Spaniſh juice, 130
Litmus, or *Lacmus*, 95
Logwood waſh, 122
Lute, called *fire-lute*, 14 :——*common*, 33

M.

Maps, how to be waſhed with colours, 381
Magneſia, its nature and uſe in enamel, 287
Marble, how to be ſtained of various colours, 521
Maſtic, 171
Maſticot, 104
Mathematical compaſſes, or *parallelogram*, 390
Matting, what, 435 :——how performed, 435
Medals, caſts of, how to be taken, 415 :——impreſſions of, how to be made, 416
Melting-pots for enamel, 273
Mending pictures 234
Mercury, its uſe in enamel colour, 303
Mezzotinto prints, how taken off on glaſs and painted, 379
Miniature painting, what, 178
Minium, 49 :——as an enamel flux, 278
Moilon, as a body for enamel, 281
Muffles for burning enamel, or painted glaſs, 274

N.

Naples yellow, 98
Native cinnabar, 48
Nut oil, 156

O.

Off-tracing, what, 386 :——how performed, 395
Oil, general nature of, as a vehicle in painting, 150 :——particular kinds of, 154 :——*drying*, 158 :——of *lavender*, 157 :——*linſeed*, 154 :——*nut*, 156 :——*poppy*, 157 :——of *turpentine*, 161
Ochre, *brown*, 127 :——*red*, 69 :——*ſcarlet*, 51 :——*yellow*, 99
Opacity of colours, what, 5
Operations ſubſervient to the preparing colours, 31
Orange colours, 119 :——*lake*, 119
Orchal, or *Archal*, 121

Orpiment, common, 105 :—*refined*, or King's yellow, 97 :—its uſe as an enamel colour, 304

P.

Painting in oil, what neceſſary to it, 173 :——how performed, 216 :——*in miniature*, or *with water colours*, what, 178 :——how performed, 220 :——in *diſtemper* or *ſize painting*, 186 :——in *freſco*, what, 189 :——how performed, 222 :——*in varniſh*, what, 190 :——how performed, 224 :——*on glaſs* with vitreous colours, 362 :——with oil, water, or varniſh colours, 379

Palette knives, what, 424 : ——for gilding, what, 425

Paper, as a ground for water colours, 220 :——how gilt, 444 ——how ſtained of various colours, 519

Paſtils, or *Crayons*, 195

Parchment, how gilt, 444 :—— how ſtained, 519

Parallelogram, or *Mathematical Compaſſes*, what, and how uſed in drawing 399

Pearl white, 136

Pictures, how to be preſerved, 224 :——how to be mended, 234 :——how cleaned, 236

Pigments, what, 3

Pink, brown, 129 :——*Dutch*, 100 :——*Engliſh*, 101 :——*light*, 102 :——*roſe*, or *roſe lake*, 68

Poliſh for gilding, 388 :——for japan work, 500 ——water, 228

Poppy oil, 157

Precipitate of gold (called purple of gold) 290 :——of gold in its metalline form, 376 :——of *copper*, 297 :——in its metalline form, 477 :——of *iron*, 299

Precipitation, what, 37

Preſerving pictures or other paintings, 224

Priming cloths for painting, 218 :——*paper* for water colours, 220 :——wood for oil painting, 218 :——for varniſh paintings, 224 :—copper-plates for oil painting, 219 :——for varniſh painting, 224

Prints, how taken off upon glaſs, and painted, 379 :——how to be waſhed with colours, 381

Pruſſian blue, 82,——*green*, 116

Purple colours, 120 :——of gold, what, and how prepared, 290

Putty, or *calcined tin*, how prepared for uſing as a white colour in enamel painting, 281

R.

Red colours, 43 :———*lead*, 49 :———*ochre*, 69
Reduction in deſigning, what, 387 :—how performed, 399
Reſin, 172
Retorts, 27
Roſe Pink, 68

S.

Safflower, 67
Saffron, tincture of, 111
Salt, fixed alkaline, as an enamel flux, 278 :———common, as an enamel flux, 279
Sand, as a body for enamel, 280
Sanderac, 171
Sanders blue, or *Blue de cendres*, 90
Sap Green, 115
Scarlet ochre, 51
Seed-lac, 169
Secondary vehicle in enamel painting, what, 263
Senegal gum, 166
Shell-lac, 170 :——varniſh, 191
Shell gold, 445
Silver, its uſe in forming, and preparation for colours in enamel, 294 :———powders, how prepared, 472
Silvering, how performed, 471 :—leather for hangings, 474
Sinking of the colours, what, 217
Size, *common*, 166 :———of *glovers cuttings*, 167 :—*parchment*, 432 :—*iſinglaſs*, 168 :—*gold* for japanners, 438 :—for burniſh gilding, 432 :—for ſilvering, 473
Smalt, 93 :———its uſe in enamal, 288
Solution, what, 36
Softneſs of enamel and fluxes, what, 261
Spaniſh brown, 55 :———*liquorice*, 130 :———*white*, 137
Spike, *oil of*, 157
Spirit (or oil) *of turpentine*, 161 :———*of wine*, as a vehicle for colours, 169 :———how rectified to any degree extemporaneouſly, 498
Staining wood black, 514 :———blue, 510 :———green, 513 :———mahogany colour, 512 :———red, 509 :———purple, 513 :———yellow, 508 :———bone, ivory, or horn, black, 518 :———blue, 517 :———green, 516 :———red, 516 :———yellow, 515 :———purple, 517 :———tortoiſe-ſhell, 517 :———paper, or parchment, blue, 520 :———purple, 521 :———yellow, 519 :

519:——alabaſter, marble, and other ſtones, of various colours, 521
Standing of colours, what, 4
Starch, how uſed for rendering water a vehicle, 168
Stones, how to be ſtained of various colours, 521
Sublimation, 31
Sublimers, 25
Sugar, and *ſugar-candy*, how uſed for rendering water a vehicle for colours, 167:——*of lead*, as a dryer, 162

T.

Tartar, its uſe in forming enamel colours, 312
Terra Japonica, or Japan earth, 128
Terra verte, 118
Terra di Sienna, burnt, 56:———unburnt, 107
Tincture of ſaffron, 111
Tin, how calcined for enamel, 281
Tranſparency of colours, what, 5
Troy white, 137
Turmeric waſh, 110
Turpentine, 171:———*oil*, or *ſpirit of*, 161
Turpeth Mineral, 107

V. U.

Varniſh, *ſeed-lac*, common, 497:———finer, 487:——coarſe, 485:——*ſhell-lac*, 191:———*maſtic*, 193:——*compound* for painting, 193:——of *gum Arabic* for preſerving pictures, 225:—*compound* for preſerving paintings, 227:——ſimpler kind of, 228:—*compound* in oil of turpentine for preſerving paintings, 229:——ſimpler kind of, 230
Varniſhing pictures, 224
Vehicles, what, 2:——general nature of, 144:——ſecondary in enamel painting, what, 263
Vellum, as a ground for painting, 221:—how to be gilt, 444
Venetian red, 54
Verdigriſe, 112:———*diſtilled*, or *cryſtals of*, 113
Verditer, 88
Vermilion, 43
Umbre, 129
Vitriol, *green*, how calcined, 18———how precipitated, 301:————*white*, 163

Ultramarine, 70 :——as a colour for enamel, 286 :——*aſhes*, 79 :——as a colour for enamel, 287
Underwork in caſting, what, and how to be managed, 409
Utenſils for making colours, 13 :——for enamel painting, 266 :——for gilding, 424

W.

Warmth in colours, what, 7
Waſh from French berries, 109 :——from turmeric, 110 :——from logwood, 122 :——from zedoary, 111
Waſhing with colours, what, 5 :——over, what, and how to be performed, 41 :——maps, prints, &c. 381
Water colours, what, 178 :——as a vehicle, 165 :——*gum*, how prepared, 180 :——how rendered a proper vehicle for colours, 165
White colours, 131 :——*flake*, 131 :——*lead*, 132 :——*pearl*, 136 :——*enamel*, 281 :——*Spaniſh* or *Troy*, 137 :——*egg-ſhell*, 138 :——*vitriol*, 163
Wood, how to be ſtained of various colours, 434

Y.

Yellow colours, 97 :——*King's*, 97 :——*Naples*, 98 :——*ochre*, 99 :——*waſh* from the French berries, 109 :——from turmeric, 110 :——from ſaffron, 111

Z.

Zaffer, its nature and uſe in enamel, 287
Zedoary waſh, 111

FINIS.